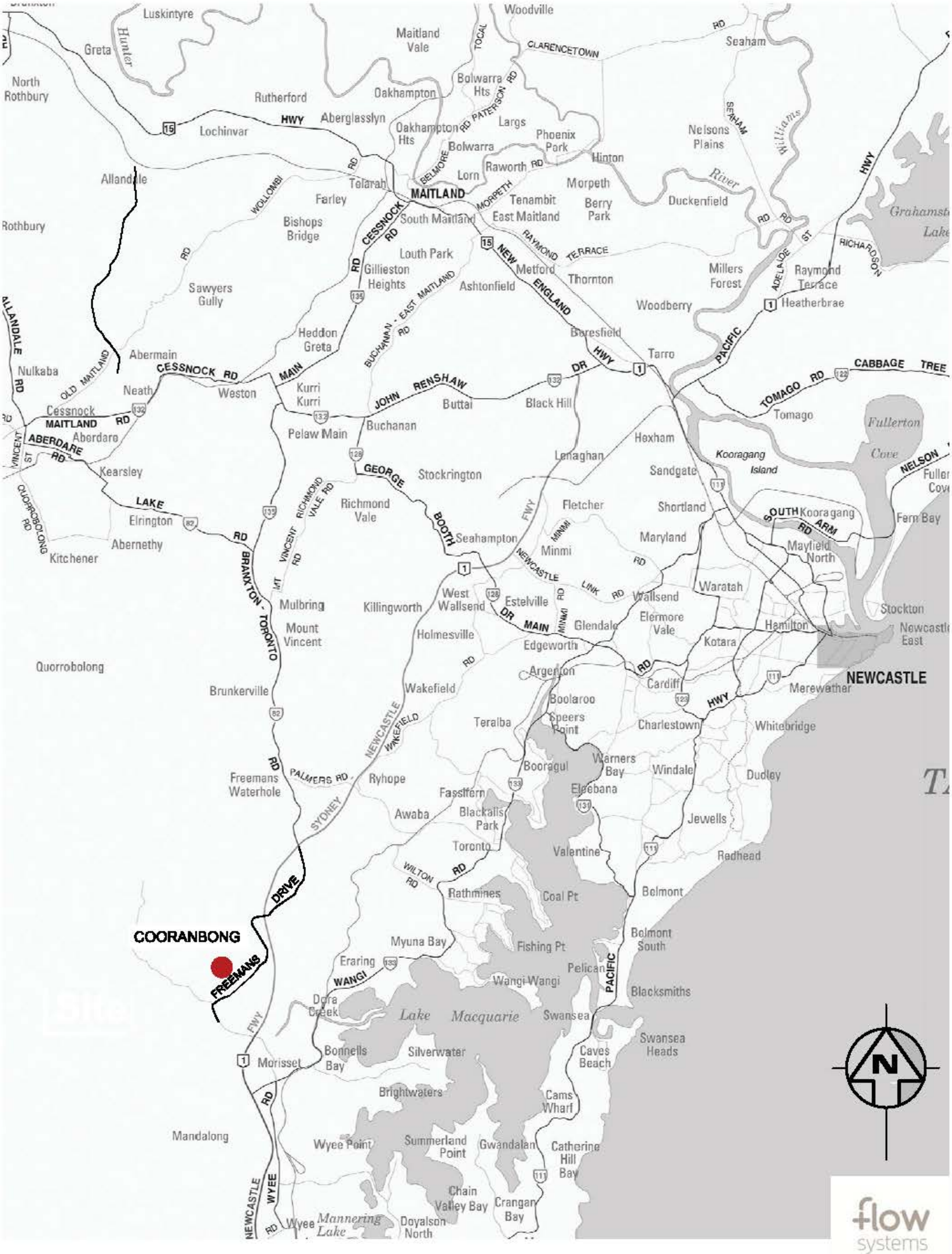
PUBLIC APPLICATION

Cooranbong Water

Appendix 3.2.5(a) North Cooranbong Development Location

flow systems

FIGURE 1



flow systems

Cooranbong Water

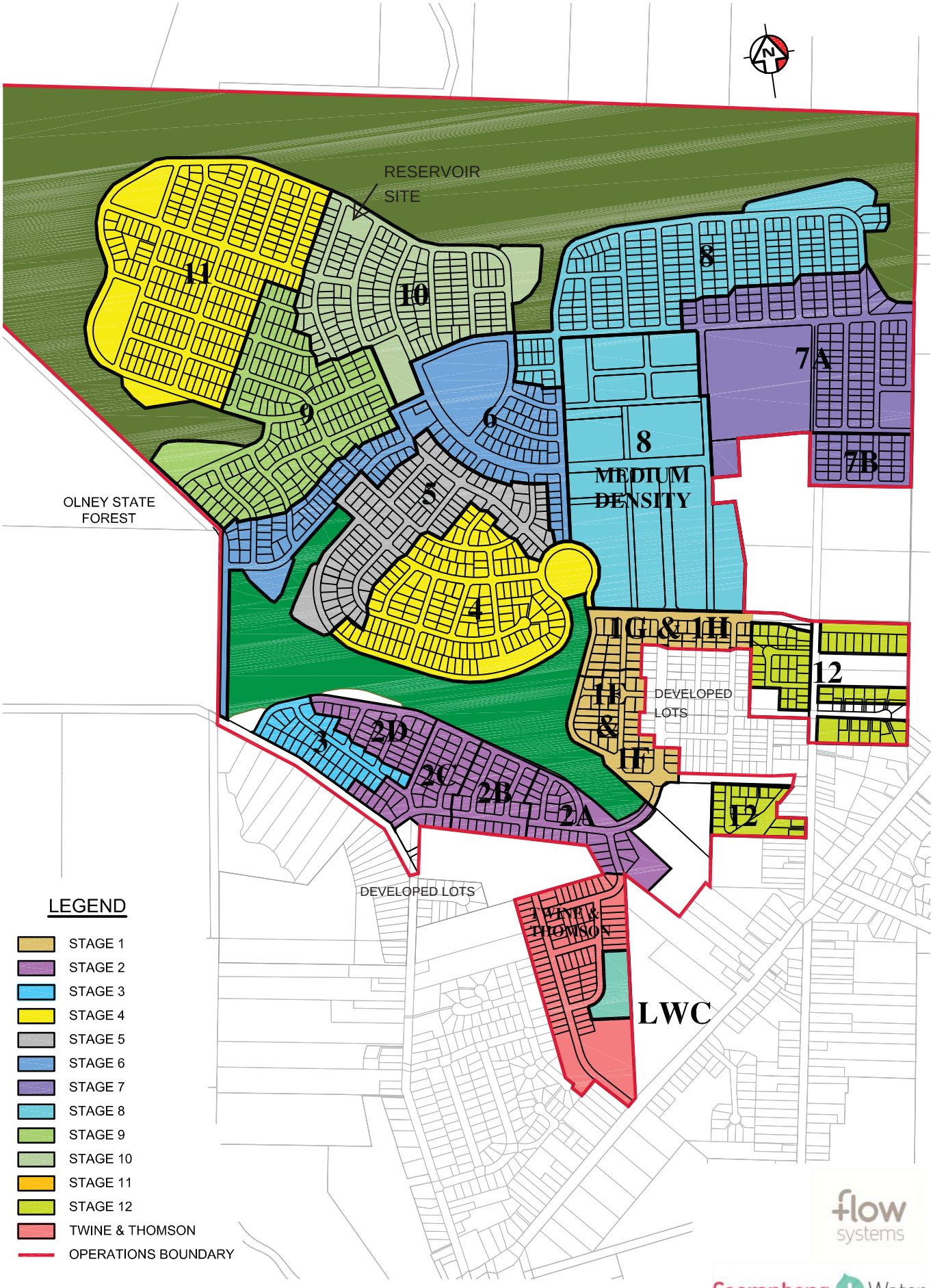
NORTH COORANBONG
LOCALITY PLAN

PUBLIC APPLICATION

Cooranbong Water

Appendix 3.2.5(b) North Cooranbong Development

flow systems



flow systems

Cooranbong Water

PUBLIC APPLICATION

Cooranbong Water

Appendix 3.5.1(a) North Cooranbong Concept Plan Approval

flow systems

Concept Approval

Section 75O and 75P of the *Environmental Planning and Assessment Act 1979*

I, the Minister for Planning, under the Environmental Planning and Assessment Act 1979 ("the Act") determine:

(a) to approve the Concept Plan referred to in Schedule 1, subject to the modifications set out in Schedule 2;
(b) the environmental assessment requirements for subsequent project or development applications associated with the Concept Plan as set out in Schedule 2;
(c) that any development or an activity associated with the approved Concept Plan be subject to Part 4 (with Council as the consent authority) or Part 5 of the Act, whichever is applicable, unless the development is, in the opinion of the Minister, development of a kind that is described in the State Environmental Planning Policy (Major Projects) 2005;
(d) that any development associated with the Concept Plan is not integrated development under section 91 of the Act.

Kristina Keneally MP
Minister for Planning

Sydney, 15 Dec 2008

SCHEDULE 1

Application No:	07_0147
Proponent:	Johnson Property Group Pty Ltd
Approval Authority:	Minister for Planning
Land:	Allotments at North Cooranbong in the Lake Macquarie Local Government Area (refer Table 1 for Lot and Plan details)
Concept Plan:	Concept Plan for the **North Cooranbong Residential Estate**, comprising 201.24ha for residential development, 2.75ha for commercial development, 17.70ha for schools (existing and proposed), 15.25ha for public open space/ recreation and community facilities and 119.13ha for environmental conservation.

NORTH COORANBONG RESIDENTIAL ESTATE - LAND

LOT	DEPOSITED PLAN
1	595941
11	129156
12	129157
20	129159
1-13	7352
1 to 8 and 10 Section 6	3353
1	825266
34	736908
2	517245
1	170378
Part 15	182756
212	1037011
1	348173
219	755218
1	329367
1	301305
13	129157
1	346776
2	346776
21	129159
1	360725
1	363639
3	1029952
2	663728
Unformed road continuing from Alton Road	

Table 1: North Cooranbong Residential Estate – Land

KEY TO TERMS OF APPROVAL

SCHEDULE 2

DEFINITIONS

Act, the	*Environmental Planning and Assessment Act 1979*
Council	Lake Macquarie City Council
DECC	Department of Environment and Climate Change
Department, the	Department of Planning
Director-General, the	Director-General of the Department of Planning (or delegate)
DWE	Department of Water and Energy
EA	*Part 3A Environmental Assessment Report & Concept Plan North Cooranbong (Volume 1 – 3)* prepared by HDB Town Planning & Design for Johnson Property Group dated March – June 2008
Minister, the	Minister for Planning
Proponent	Johnson Property Group Pty Ltd
PPR	*Preferred Project Report for North Cooranbong,* prepared by HDB Town Planning & Design for Johnson Property Group dated 27 October 2008
Site	Land to which Concept Plan Application 07_0147 applies
Terms of Approval	The Minister's terms of approval for the Concept Plan

1. ADMINISTRATIVE TERMS OF APPROVAL

Terms of Concept Approval

1.1 The Proponent shall carry out the concept plan generally in accordance with the:
- a) Concept Plan Application 07_0147;
- b) *Part 3A Environmental Assessment Report & Concept Plan North Cooranbong (Volume 1 – 3)* prepared by HDB Town Planning & Design for Johnson Property Group dated March – June 2008;
- c) *Preferred Project Report for North Cooranbong,* prepared by HDB Town Planning & Design for Johnson Property Group dated 27 October 2008;
- d) the terms and modifications of this approval.

1.2 In the event of an inconsistency between:
- a) the terms/modifications of this approval and any document listed from 1.1(a) to 1.1(c) inclusive, the terms/modifications of this approval shall prevail to the extent of the inconsistency; and
- b) any document listed from i1.1(a) to 1.1(c) inclusive, the most recent document shall prevail to the extent of the inconsistency.

Limits of Approval

1.3 This concept approval shall lapse five years after the date on which it is granted, unless an application is submitted to carry out a project or development for which concept approval has been given.

1.4 To avoid any doubt, this concept approval does not permit the construction of any aspect of the proposal which will be subject to separate project approvals.

Determination of Future Applications

1.5 The determination of future applications for development on the Site under Part 4 of the Act is to be generally consistent with the terms of this approval.

2. MODIFICATIONS TO THE CONCEPT

Design Guidelines

2.1 Approval is not provided for the proposed Development Control Plan or Design Guidelines part of this application (Appendix S in the Environmental Assessment dated March – June 2008 and Commitment 19 in the Statement of Commitments in the Preferred Project Report dated 27October 2008).

2.2 The proposed Development Control Plan shall be replaced with Design Guidelines to be developed for future development in the North Cooranbong Residential Estate. The Design Guidelines should include a statement on the desired future character of the area and guidelines for:

- subdivision pattern and development staging
- site coverage
- urban design
- setbacks and building height
- building design/character and external finishes
- appropriate construction types/methods
- water sensitive urban design (including proposal for dual reticulation)

Specific controls should also be included in the relevant precinct guidelines for:

- mine subsidence
- land contamination
- bushfire protection
- appropriate setback buffers to the adjoining Onley State Forest
- Local Park South fronting 3 roads

2.3 The Design Guidelines are to be prepared in consultation with and approved by Council prior to the issue of the first consent by Council for development under this concept plan approval. If Council fails to approve the Design Guidelines within 2 months of lodgement for approval they are to be submitted for approval to the Director-General of the Department of Planning.

3. FURTHER ASSESSMENT REQUIREMENTS

Local Park South

3.1 The applicable subdivision application must provide Local Park South with 3 road frontages.

Stormwater

3.2 All stormwater works shall be designed in consultation with and to the satisfaction of Council.

3.3 No stormwater may be discharged to a natural watercourse unless there is no negative impact on baseline water quality.

3.4 Detailed flood modelling assessment shall be submitted with each precinct subdivision application. The model shall identify the areas of the site that are affected by flooding in the 100 year storm event.

3.5 All stormwater treatment basins and stormwater management controls shall be located above the 100 year flood level.

3.6 Stormwater quality shall generally meet the requirements set out in Table 1.2 of Australian Runoff Quality – A Guide to Water Sensitive Urban Design, Engineers Australia, 2006. All stormwater quality treatment controls shall be designed in accordance with the requirements of the above manual.

Riparian Zones

3.7 Any subdivision plan should achieve the following minimum Core Riparian Zones:

- Minimum of 10m for any intermittently flowing 1st order watercourse
- 20m for any permanently flowing 1st order watercourse or any 2nd order watercourse
- 20m – 40m (merit based assessment) for any 3rd order or greater watercourse

Contamination

3.8 The first application for subdivision of the land must be accompanied by a Stage Two detailed site contamination assessment in accordance with SEPP 55 (and associated guidelines), with particular focus on the areas identified in the Douglas Partners Reports reference 31720 and dated 11 December 2001, 24 July 2002, 23 October 2003 and 7 March 2005.

Geotechnical

3.9 Erosion and sediment control plans to be submitted in accordance with Statement of Commitment 6 must be prepared in accordance with the requirements of *Managing Urban Stormwater* dated 2004 and published by Landcom.

3.10 Any development application for land within the Department of Land's Acid Sulphate Planning Maps shall be accompanied by an Acid Sulphate Soil Management Plan.

Mine Subsidence

3.11 Any development of land within the West Lake Mine Subsidence District must be referred for approval by the Mine Subsidence Board and conform to Mine Subsidence parameters.

Bushfire Protection

3.12 Proposed perimeter road and building alignments much achieve the minimum Assess Protection Zone (APZ) contained in *Planning for Bushfire Protection 2006* published by NSW Rural Fire Service. Where no perimeter road is provided the APZ must be achieved within lot boundaries.

Onley State Forest

3.13 Where residential development is to adjoin the Onley State Forest a perimeter road and setback consistent with any setback specified in the Design Guidelines required under 2.2 of this Instrument must be provided.

Aboriginal Heritage

3.14 An Aboriginal Cultural Assessment must be prepared and approved by Council prior to any works taking place for any development proposed within the area designated "Further Investigation Required' in the Archaeological Survey and Constraints Study dated July 1st 2003.

3.15 If aboriginal cultural objects are uncovered due to development activities, all works must halt in the immediate area. A suitably qualified archaeologist, Aboriginal community representative and DECC must be contacted to determine the significance of the find(s).

Advisory Note: The gazetted SEPP Amendment contains provisions requiring that satisfactory arrangements are made for the provision of designated state infrastructure prior to subdivision consent being issued for the land. The Department of Planning will consider the executed regional VPA as satisfactory arrangements.

PUBLIC APPLICATION

Cooranbong Water

Appendix 3.5.1(b) North Cooranbong Environmental Assessment Report

flow systems

STATE SIGNIFICANT SITE ENVIRONMENTAL ASSESSMENT REPORT & CONCEPT PLAN

For

North Cooranbong Residential Development

Prepared for

Johnson Property Group Pty Ltd

March - June 2008

Prepared by:

HDB TownPlanning&Design

Document History and Status

Issue	Revision	Issued To	Qty	Issue Date	Author	Reviewed
A	Draft	HDB	1	16/11/2007	HDB	BG
A	Draft	JPG	1	16/11/2007	HDB	KN?BG
B	Draft	JPG	2	16/11/2007	HDB	KN/BG
B	Final	JPG	2	19/12/2007	HDB	BG
C	Final	JPG	1	28/2/2008	HDB	DoP
C	Final	DoP	7	--/5/2008-	HDB	DoP
D	Final	DoP	7	4/6/2008	HDB	

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Printed:	4/06/2008
File:	G:\Jobs\2007\0775 - JPG - PART 3A - COORANBONG\Publication
Client:	**JPG Pty Ltd**
HDB Project Manager:	Mr Kerry Nichols
HDB Reference Number:	07/75

DISCLAIMER:

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Persons and/or other legally recognised entities wishing to use any details provided in this document that may affect financial decisions are strongly urged to seek legal advice and contact relevant government authorities, and relevant specialist consultants to obtain current information and to verify the current status of the information contained herein this document.

Environmental Assessment

This Environmental Assessment has been prepared in accordance with Part3A of the *Environmental Planning and Assessment Act* 1979 (as amended).

This Document has been prepared by:

Company:	HDB Town Planning and Design
Project Manager	Mr Kerry Nichols MPIA CPP
Position	Principal
Qualifications	Grad Dip URP Cert. Civil Eng. L & ESD M.PIA CPP

Proponent. This Report has been prepared for:

Company	Johnson Property Group Pty Ltd Incorporating Avondale Greens Pty Ltd and ACA
Managing Director	Mr Keith Johnson
Senior Development Manager	Mr Bryan Garland
Contact Details	PO Box A1308 SYDNEY NSW 1235

Declaration

I certify that the following Environmental Assessment Report has been prepared in accordance with the requirements of Part 3A of the Act and that, to the best of my knowledge, the information contained in this report is not false or misleading.

Mr Kerry Nichols
M/PIA, CPP

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Appendix A(i)	Geotechnical – Triangular Lot *Douglas Partners Pty Ltd*
Appendix A(ii)	Geotechnical – Town Common *Douglas Partners Pty Ltd*
Appendix B	North Cooranbong Flora Assessment & Part Test *Anne Clements & Associates Pty Ltd*
Appendix B(i)	Flora Assessment – Triangular Lot *Anne Clements & Associates Pty Ltd*
Appendix B(ii)	Flora & Fauna Assessment – Town Common *Harper Somers O'Sullivan Pty Ltd*
Appendix B(iii)	Distribution of Threatened Species *Harper Somers O'Sullivan Pty Ltd*
Appendix B(iv)	North Cooranbong Impact on 3 listed flora species *Anne Clements & Associates Pty Ltd*
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Appendix D	Utility Consultation: • *Agility* • *Mine Subsidence x 2* • *Energy Australia*
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Appendix J(iii)	Draft Stormwater Management Plan – Town Common
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Appendix K	Heritage Impact Assessment
	Graham Brooks & Associates Pty Ltd
Appendix L	Archaeological Survey (with supporting letter)
	Myall Coast Archaeological Pty Ltd
Appendix L(i)	Aboriginal Heritage Assessment – Triangular Lot
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Appendix M	Social Impact Assessment
	Key Insights Pty Ltd
Appendix N	Road Traffic Noise Impact Assessment North Cooranbong Residential Estate
	Reverb Acoustics Pty Ltd
Appendix O	Economic Impact Assessment
	Hill PDA Consulting
Appendix P	North Cooranbong Concept Plan
	HDB Town Planning and Design
Appendix Q	Flood and Drainage Report
	PPK Pty Ltd
Appendix R	Proposed North Cooranbong Transport Strategy (TMAP)
	Better Transport Futures
Appendix R(i)	Technical Review of Recommended Traffic Treatments – Joint Statement
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Appendix S	Draft North Cooranbong Development Control Plan
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Appendix T	Letter from Quantity Surveyor and Costing Table
	WT Partnership

Figures

Tables

Acronyms & Abbreviations	
APZ	Asset Protection Zone
CO_2	Carbon Dioxide
DECC	Department of Environment and Conservation
DEWHA	Department of Environment, Water, Heritage and The Arts
DG	Director General
DGR's	Director Generals Requirements
DoP	Department of Planning
EA	Environmental Assessment
EPA Act (The Act)	Environmental Planning & Assessment Act
EPBC Act	Environmental Protection and Biodiversity Act
EPI	Environmental Planning Instrument
ESD	Ecologically Sustainable Development
HDB	HDB Town Planning & Design
HREP	Hunter Regional Environmental Plan
HWC	Hunter Water Cooperation
IPCC	Intergovernmental Panel on Climate Change
JPG	Johnson Property Group
LEP	Local Environmental Plan
LGA	Local Government Area
LHRS	Lower Hunter Regional Strategy
LMCC	Lake Macquarie City Council
MoT	Ministry of Transport
PBP2006	Planning for Bushfire Protection 2006
REP	Regional Environmental Plan
RFS	Rural Fire Services
SEPP	State Environmental Planning Policy
SSS	State Significant Site

EXECUTIVE SUMMARY

Purpose of this Report

This report seeks to address the Director General's requirements in respect to the preparation of an Environmental Assessment and State Significant Site Study of the North Cooranbong concept plan pursuant to Part 3A of the Environmental Planning and Assessment Act 1979 (EP&A Act 1979).

Project Outline

The concept plan for North Cooranbong has the following characteristics:

- Total Area 365ha
- 186ha residential land
- 2.15ha commercial support
- 16.8ha public recreation / open space
- 115.03ha environmental conservation land
- Upgrading of local road network to support the concept, and
- Servicing and infrastructure to support the existing and future urban area.

Estimated Capital Investment Value for the project is $587,472,000.00. This figure has been calculated by WT Quantity Surveyors. A copy of the Quantity Surveyors Letter including a table showing calculated construction costs is attached as ***Appendix T.***

The Proponent

The proponent of the North Cooranbong Concept is:

- Johnson Property Group Pty Ltd
  PO Box A1308 Sydney South 1235
  338 Kent Street
  Sydney NSW 2000

Planning Context

The North Cooranbong area is identified in the Lower Hunter Regional Strategy as being a future residential development area to accommodate up to 3000 residential lots. Due to constraints, the site has the ability to provide in the order 2300-2500 residential lots which represents up-to 2.1% of all new residential housing identified under the Strategy. For the purposes of this Concept Plan, the Environmental Assessment Report assumes a total yield of 2500 residential allotments.

The site is located wholly within the Local Government Area of Lake Macquarie and is identified in the Lake Macquarie LEP 2004 as predominately an urban investigation area. Prior to the assessment of the site under Part 3A of the EPA Act

1979 the site was subject to a rezoning application (draft Lake Macquarie LEP Amendment 27) to enable residential development consistent with the Lower Hunter Regional Strategy and the Lake Macquarie Councils Lifestyle 2020 Strategy.

The Environmental Assessment contained in this document has been based on the requirements of the Director General of the NSW Department of Planning, dated 23 November 2007. The specific Director Generals Requirements are reproduced as follows:

Major Project No.	MP07_0147 (Concept Plan)
General Requirements	The Environmental Assessment (EA) must include (1) An executive summary; (2) A detailed description of the project including: (a) strategic justification for the project; (b) the various components and stages of the project in detail (eg land uses, infrastructure and dedications) (3) A consideration of the following with any variations to be justified: (a) all relevant State, Regional and Local (including Draft) Environmental Planning Instruments (b) all applicable Planning Strategies such as the Lower Hunter Regional Strategy and Lake Macquarie City Council's Lifestyle 2020 Strategy (c) all applicable s117 Directions and DoP Circulars (d) Environmental Protection and Biodiversity Conservation Act 1999. (4) An assessment of the social, environmental and economic impact of the proposal with particular focus on the Key Assessment Requirements outlined below. (5) A draft Statement of Commitments, outlining commitments to manage, mitigate and /or monitor the social, environmental and economic impacts of the project with a clear identification of who is responsible for these measures and when the commitments will be fulfilled (6) A report from a quantity surveyor identifying the capital investment value for the works outlined in the concept plan (7) An indication of employment generated by the project. (8) A conclusion justifying the project having regard to the General Requirements above. (9) A signed statement from the author of the EA certifying that the information contained in the report is neither false nor misleading
Key Assessment Requirements	The Environmental Assessment must address the following key issues: **1. Site Analysis** (1) Undertake a site opportunity and constraints analysis that identifies the relevant natural and built environmental features within and adjoining the Site. (2) The site analysis should form the basis for justifying the configuration of the development of the land and the mix of land

	uses. **2. Urban Design** (1) Provide a plan showing the proposed development and conservation footprints, their areas and proposed zonings. (2) Provide an indicative lot, open space and street layout and nominate indicative total lot yield, mix and density. (3) Demonstrate a range of housing will be made available on site (4) Demonstrate compliance with the Urban Design and Neighborhood Planning Principles and density provisions contained in the Lower Hunter Regional Strategy. (5) Develop conceptual design guidelines for housing and open space (both public and private realm) and identify how the design guidelines will be implemented. **3. Visual Impact** (1) Identify any visual impact created by the project and mitigation measures. **4. Open Space and Facilities** (1) Provide details of publicly available open space and facilities to be provided, long term management and maintenance arrangements and proposed ownership. **5. Utilities and Infrastructure** (1) Provide a utility and infrastructure servicing strategy identifying existing capacity and any necessary staged augmentation. (2) The strategy should include means for a recycled water service. **6. Drainage, Stormwater and Groundwater Management** (1) Provide a drainage, stormwater and groundwater management strategy identifying measures to be incorporated on site, including on site stormwater detention and WSUD measures (2) The strategy should demonstrate compliance with the principles of the NSW Groundwater Policy Framework. **7. Flooding** (1) Identify and address any potential flooding risk faced or created by the project. **8. Biodiversity** (1) Address the impact of the development on existing native flora and fauna and their habitats, including identified threatened species, having regard to the Threatened Species Assessment Guidelines and recommend a biodiversity conservation strategy including offset and/or rehabilitation measures to avoid or mitigate impacts on threatened species and their habitat. (2) Consider the development of ecological corridors to link flora and fauna corridors within the site and to adjoining sites. (3) Consider and mitigate any impact upon watercourses and associated riparian buffer / vegetation (4) Identify the intended ownership and long term management (including funding arrangements) for conservation lands. (5) Comprehensively address potential impacts on, and proposed mitigation measure for listed threatened species under the EPBC Act (including *Angophora inopina, grevillea paviflora subsp. Paviflora* and *Tetratheca juncea).* **9. Contamination, Geotechnical and Mine Subsidence** (1) Provide a report detailing the suitability of the site for its proposed uses having regard to matter such as erosion hazard, slope

	stability, uncontrolled fill, soil reactivity, saturated soils, acid sulphate soils, mine subsidence and site contamination. (2) Demonstrate that suitable measures will be made in accordance with SEPP 55 to address any contamination issues. **10. Bushfire** (1) Demonstrate compliance with *Planning for Bush Fire Protection 2006* (2) Identify ownership and ongoing management of any proposed APZs **11. Heritage** (1) Identify and assess any items of European and Indigenous heritage on site and any potential impacts created by the project. (2) Provide an assessment against DECCs draft *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation.* **12. Traffic and Transport** (1) Prepare a Traffic Study in accordance with RTA's *Guide Traffic Generating Developments* (2) Prepare a TMAP which addresses the requirements covered in the Interim TMAP Guidelines which are available at www.transport.nsw.gov.au **13. Social Infrastructure** (1) Demonstrate there will be sufficient social services and infrastructure to support the population generated by project. (2) Identify positive & negative impacts and the means to mitigate any negative impacts **14. Employment** (1) Identify and address the employment needs of the incoming population. **15. Commercial Development** (1) Justify the amount and type of commercial development proposed by the project both in terms of the ongoing economic viability of existing commercial development and the objectives of the Lower Hunter Regional Strategy. **16. Planning Agreements and /or Developer Contributions** (1) Provide the scope and justification for any planning agreement(s) (should one or more be proposed) between the proponent, Council and other Agencies for matters such as regional and local infrastructure, social infrastructure, public transport, recreational and community facilities and the like. **17. Ecologically Sustainable Development** (1) Demonstrate how the development will commit to ESD principles. **18. State Significant Site (SSS)Study** (1) As outlined in correspondence from DoP to JPG dated 8 November 2007 a SSS study is required to be prepared by the proponent (2) This SSS study should be completed and submitted concurrently with the Environmental Assessment. This will enable joint assessment and concurrent exhibition of the EA and SSS study.

Consultation Requirements	An appropriate and justified level of consultation should be undertaken with the following relevant parties during the preparation of the environmental assessment, having regard to any previous consultation. *a) Agencies and other authorities:* • Lake Macquarie City Council • NSW Department of Water and Energy • Hunter Water Corporation • NSW Ministry of Transport; • NSW Roads and Traffic Authority; • NSW Department of Education and Training; • NSW Department of Conservation and Climate Change; • NSW Rural Fire Service; • Commonwealth Department of Environment and Water Resources and • All relevant utility providers. *b) Public* Document all community consultation undertaken to date or discuss the proposed strategy for undertaking community consultation. This should include any contingencies for addressing any issues arising from the community consultation and an effective communications strategy. The consultation process and the issues raised should be described in the Environmental Assessment.

The Site

The subject site is based around the former Cooranbong Aerodrome and includes a number of surrounding landholdings. It is located to the north of the existing Cooranbong Village and directly adjoins existing residential areas of the Cooranbong suburb. The closest regional centre is Morisset located approximately 5km to the southeast of the subject site and the closest district centre is Cooranbong village 1km away.

The subject site has close access to the F3 Freeway to travel north to Newcastle and south to Sydney. Local road connections exist to Freeman's Drive (MR220) and provide access to the existing urban areas of Cooranbong and Morisset.

Existing Site Uses & Modifications

The majority of the site is currently degraded resulting from its previous aerodrome land use. Much of the site is undeveloped yet has been subject to various levels of human disturbance. The most significant site use is the Avondale School which is located in the southeast corner. The dominating feature of the site remains the sealed airstrip.

Background to Proposal

Following the closure of the Avondale Aviation Collage the site was foreshadowed as a possible site for future urban development and as such was included in the Lower Hunter Regional Strategy as future residential lands. The site was further identified for future urban development in the Lake Macquarie Lifestyle 2020 Strategy and ultimately Lake Macquarie Local Environmental Plan 2004, before the closure of the airport.

As a result a rezoning application was lodged to alter the zoning of the site to accommodate this proposed use. This application was lodged in March 2005. However, prior to finalising the rezoning, the NSW Government released the Lower Hunter Regional Strategy to guide development in the Hunter over a 25 year time horizon. North Cooranbong was listed as an important site in this strategy (and therefore important to the State), and therefore an application was made to have the sites future assessed by the Minister under Part 3A of the EPA Act 1979. This was due to the size and importance of the site and the need to ensure the timely and efficient delivery of residential land for the community, in line with the strategy. With the proximity of the site to the Morisset Town Centre, it is envisaged that this development will provide the backbone to support Morisset as a future Major Centre (as identified in the Lower Hunter Regional Strategy).

The document provides a Concept Plan and Environmental Assessment for preliminary consideration and feedback by the NSW Department of Planning, and a State Significant Site Study in support of inclusion of the subject site in Schedule 4 of the SEPP (Major Projects) 2005.

Infrastructure Environmental Impacts

Traffic & Transport

The existing road and transport system operations in the area have been investigated and the likely impacts of the proposed development noted. Works in regard to upgrading of various items including the intersections of Freeman's Drive and Avondale Road and extension of the existing local road system to service this area have been identified to offset this impact.

Local bus services and Cycleways are planned to be extended to meet increased demand. These are more fully identified in the report and accompanying T-Map.

Biodiversity

Extensive studies have been undertaken on the site as part of previous and current environmental investigations. The proposed concept plan has taken into consideration the ecological constraints of the site to provide offset areas to preserve important vegetation. Riparian areas have been protected to maintain water quality and provide an internal green .open space linkage.

Additional land at the Town Common site, outside the main site, is also proposed to be conserved.

There are a number of environmental constraints on the site which in the main have been provided for by extending ecological zones. As further justification for development, discussions are underway with relevant Government agencies in regard to monetary contributions for offsets. This is reflected in the commitments given by the developer.

For further discussion on biodiversity, refer to Section 7.3 of this report.

Stormwater Management & Quality

The North Cooranbong site is situated in the Dora Creek Catchment which feeds directly into Lake Macquarie. As such, it is important that the quality of water leaving the site is of a standard acceptable for the receiving catchment. The internal site design has provided riparian buffers along creek lines to prevent human disturbance directly effecting waterways, thereby reducing potential negative effects on these waterways. Additional water quality devices have been provided within the residential area to ensure water quality leaving the site is of an acceptable standard.

As previously mentioned the Town Common site to the south of the main site is to be used for environmental conservation and open space. A site specific Stormwater Management Plan will be prepared to ensure any activity on this site will protect the local waterways and receiving catchments.

Geology

A number of geological investigations have been undertaken on the site as part of part and current planning and design studies. It has been concluded that the site has few constraints which inhibit its ability to safely accept residential development in the future. Furthermore no resources have been identified on or in the site whose recovery would be prevented by the concept plan. A full explanation of the sites' geology is provided in Section 7.5 of this report.

Additional Issues

A number of additional site specific baseline studies were undertaken as part of the planning process for the site. This includes European and Indigenous heritage, bushfire and social impact assessment. The recommendations of these reports were taken into consideration during the development of the concept design

Staging & Implementation

Given the size of the site, a staged implementation of servicing and infrastructure closely associated with the staged release of residential land is required. Due to

the time frame to fully develop the site (15-20 years) flexibility needs to be incorporated to allow response to changing parameters and market demand.

A draft precinct plan has been attached to this concept plan. It is anticipated that up to 200 residential lots would be released per precinct, with each precinct divided into approximately 8 stages of 25 lots.

Conclusion

The North Cooranbong site provides a sound opportunity to support the Lower Hunter Regional Strategy in providing strategically located, adequate and affordable residential land for the future growth of the region.

The subject site is in close proximity to existing urban infrastructure and transport opportunities. It will provide support to the Emerging Major Centre of Morisset, builds on the existing Avondale School precinct to support its future viability and growth, as well as providing support for Avondale College's quest for university status. Approval of the concept plan under Part 3A of the Act and the SEPP (Major Projects) 2005 will allow this project to proceed and meet the objectives of the Lower Hunter Regional Strategy..

1.0 INTRODUCTION

1.1 Introduction

HDB Town Planning and Design Pty Ltd (HDB) has been engaged by Johnson Property Group Pty Ltd (JPG) to prepare an Environmental Assessment Report (EAR) to be submitted to the Minister for Planning pursuant to Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). This report has been prepared to fulfill the Environmental Assessment Requirements issued by the Director General for a concept plan approval. The development of the subject site comprises approximately 365ha of land in the North Cooranbong area, located on the western side of Lake Macquarie.

This report also includes a State Significant Site Study undertaken to assist the Minister in determining whether the subject site should be classified as a State Significant Site under the Major Projects SEPP. The information contained in this report and its supporting documents has been prepared to seek concept plan approval for:

- 365ha (Approx) of land to be developed for up to 2,500 lots.
- Provision of servicing and infrastructure.
- The provision of up to 115.03ha of land for conservation.

This report provides a description of the site, the proposal and the environmental, social and economic features and implications of the proposal in line with the requirements of the Director General, dated 23 November 2007. The report has been divided into the following sections:

Table 1 – Report Sections

Section 1	Introduction
Section 2	General site description and existing characteristics in relation to both the local and region contexts
Section 3	The planning framework, both statutory and strategic, which apply to the site and the proposal.
Section 4	The State Significance of the site as defined by the Major projects SEPP.
Section 5	A detailed description of the Concept and its design features.
Section 6	Description of Voluntary planning agreements in relation to the proposal.
Section 7	Environmental Assessment in line with the requirements of the Director General.
Section 8	Draft Statement of Commitments
Section 9	Conclusion and project justification
Appendices	Appendices including technical reports referenced in this document.

1.2 Background

The North Cooranbong site involves a significant area of land that once housed a private aerodrome, owned and operated by the nearby Avondale School, Cooranbong.

The aerodrome and associated flying school became an unsustainable financial burden on the School, with only 23 heavily subsidized students enrolled in 2001. The facility drew increasingly on each annual budget in order to meet and maintain increasingly stringent air and ground safety standards and insurances, and to ensure that the aircraft, the site utilities (for fuelling, maintenance etc) and associated buildings are of a required condition. There was increasing reliance on cross subsidisation from the other educational businesses and this was at the expense of the mid term aspiration of becoming a new University.

The private aerodrome was officially decommissioned in December 2005 and the air school was relocated to Cessnock airport. This in turn creates a new environmental, social and economic opportunities for land that is strategically located within the walkable catchment of Avondale College, Avondale School, Cooranbong retail area, existing community buildings and facilities, and major employment associated with the Sanitarium factory and the Avondale College.

As part of the comprehensive review of the Lake Macquarie Local Environmental Plan, Council rezoned the land to investigation purposes in its new citywide Lake Macquarie (LM) LEP 2004. This was in recognition of the new land use opportunities, particularly given the interest in creating a critical mass of population around the existing Cooranbong centre with existing public and private infrastructure and an emerging University.

After 2 years of detailed site assessment, strategic planning and discussions with the Dept. of Planning, Lake Macquarie Council and DECC, Johnson Property Group (for themselves and on behalf of the Seventh-day Adventist Church) lodged a rezoning submission with Lake Macquarie Council on 15th March 2005.

The rezoning submission was jointly prepared by JW Planning Pty Ltd and Architectus Pty Ltd, and the submission constituted a detailed environmental study informed by a multi-disciplinary consultant team

Key dates since the rezoning submission was lodged are listed in **Table 2**:

Table 2 – Rezoning Chronology

Date	Milestone
20 June 2005	Section 54 resolution to prepare and exhibit an amendment (no.27) to LMLEP 2004 to accommodate the proposal
14 July 2005	Council notify Dept of Planning of s54 draft amendment no.27
5 August 2005	Dept of Planning directs Council to prepare a Local Environmental Study (LES)
December 2005	Council appoint 3rd party to prepare LES – URS Pty Ltd
Jul / Sep 2006	Council consult with Government agencies pursuant to s62
December 2006	URS finalise LES
5 February 2007	Council adopt LES, amend dLEP and resolve to seek s65 certificate to publicly exhibit the proposal
May / Aug 2007	Draft LEP and LES publicly exhibited pursuant to section 66
August 2007	2 years after rezoning submission, JPG seek Part 3A recognition
October 2007	Minister for Planning formed the view that the North Cooranbong proposal is a development to which Part 3A applies.

The development now proposed has been reviewed and amended to that previously submitted to Council. The Concept Plan has been developed having regard to the findings of previous and current studies.

1.3 Proponent / Project Team

The proponent for the proposal outlined in this document is Johnson Property Group Pty Ltd.

Over a period of 5 years, a project team was assembled to provide in depth information in their respective specialisations. The baseline studies previously considered on the site (under the previous Councils zoning scheme) remain relevant and have been referred to in this document. The following is a list of consultants whose input was used in the formation of the concept plan, and environmental analysis included in this report.

Table 3 – Project Team

Area of Expertise	Consultant
Project Management	Johnson Property Group Pty Ltd
Urban Design	Architectus and HDB Town Planning & Design
Urban Planning	JW Planning and HDB Town Planning & Design
Social Impact Assessment	Key insights Pty Ltd and HDB Town Planning & Design
Landscaping	HDB Town Planning and Design
Bushfire	HDB Town Planning and Design
Traffic and Transport	GHD and Better Transport Futures Pty Ltd
Community Consultation	Key Insights Pty Ltd
Stormwater	Patterson Britton and Partners Pty Ltd
Water and Wastewater Servicing	Patterson Britton and Partners Pty Ltd
Heritage - Aerodrome	Graham Brooks & Associates Pty Ltd
Cultural Heritage Assessment	Myall Coast Archaeological Services
Flooding and Drainage	PPK Environment and Infrastructure Pty Ltd
Retail Location Analysis	Architectus Pty Ltd
Visual impact Assessment	Architectus Pty Ltd
North Cooranbong Creek Assessment	Patterson Britton and Partners
Water Management Principles	Patterson Britton and Partners
Threatened Flora and Fauna Assessment	Austeco – Environmental Consultants Harper Somers O'Sullivan
Flora and Fauna 8 Part test	Anne Clements and Associates Pty Ltd Harper Somers O'Sullivan
Geotechnical Site Assessment	Douglas Partners Pty Ltd

1.4 Consultation

1.4.1 Stakeholder Consultation

The proposal to rezone the land has been the subject of formal consultation with government agencies, infrastructure authorities and key stakeholders pursuant to section 62 of the EP&A Act, 1979. This consultation occurred under the previous Council rezoning process.

The organisations consulted are presented in **Table 4**. The table is an extract from the Council report which sought a resolution to amend the draft LEP and obtain

authority under s65 to commence public exhibition (Lake Macquarie Council Report No. 07ST006 - 5 February, 2007).

Table 4 – Section 62 Stakeholder Consultation

1	Department of Planning (DoP)
2	Roads and Traffic Authority (RTA)
3	Department of Environment and Conservation (DEC)
4	NSW Rural Fire Service (RFS)
5	Department of Primary Industries (Agriculture & Mineral Resources)
6	Hunter Water Corporation (HWC)
7	Department of Education and Training (DET)
8	Department of Community Services (DOCs)
9	Mine Subsidence Board (MSB)
10	Department of Lands (DoL)
11	Hunter-Central Rivers Catchment Management Authority (CMA)

The proponent has had independent discussions with service providers including Hunter Water, Telstra and Energy Australia, and workshops were held with all relevant Departments within Lake Macquarie Council when Council was processing the rezoning application.

None of the agencies had raised objections during the section 62 consultation process.

In light of the release of the Lower hunter Regional Strategy and the draft Regional Conservation Plan by the NSW State Government, and therefore acknowledging the regional and state significance of the site, the proponent held a number of discussions'. These have occurred, primarily with DECC and DoP, to review the Concept Plan and arrive at an alternate footprint that maximises the development on this site while allowing significant ecological conservation to occur. In addition, consultation has occurred with Department of Environment, Water, Heritage and the Arts in respect to the impact of this development on federally listed species. Advice has been received that the project is considered a Controlled Action under the Environmental Protection and Biodiversity Conservation Act 1999. Refer ***Appendix E***.

1.4.2 Public Consultation

The previous proposal for development of the site was exhibited by Council for public comment for three months between May to August 2007. Councils records indicated, a total of 26 separate submissions were received (plus a number of petitions). A breakdown of the nature of the submissions by Council is provided in **Table 5**.

Table 5 – Nature of Public Submissions

Nature of Submission	No. of Submissions	Nature of Concerns
Specific objection to the proposal	2	Loss of airfield, inadequate infrastructure, environmental impact
Objection to elements of the proposal	15	Size and existence of commercial and open space zones, exclusion of adjoining property
Request further consideration and/or adjustment of the proposal	9	Neighbourhood character, affordable housing, transport and access, environmental management

During the public exhibition process Johnson Property Group voluntarily gave presentations to the Central Coast Community Environment Network (CCEN) and the Cooranbong Chamber of Commerce (CCC). Over 200 people attended the MCC presentation. The event was advertised on the radio and in local and regional print media.

The current concept plan was developed having regard to the comments received during exhibition of the previous rezoning process, the objectives pf the Lower Hunter Regional Strategy and draft Regional Conservation Plan and subsequent discussions with DoP, DECC and LMCC. In this regard while the concepts are similar, there have been some reorganisation of proposed land uses.

2.0 THE SITE

2.1 The Locality

The proposed development is located on the western side of Lake Macquarie and directly joins the existing urban area of Cooranbong Village(to the north). The site is approximately 1.2km to the west of the F3 (Sydney-Newcastle) Freeway and approximately 5km from the nearby centre of Morisset. Importantly Morisset represents an Emerging Major Regional Centre in the Lower Hunter Regional Strategy. Cooranbong is the largest urban release area in the Morisset Planning District (and the largest in southern Lake Macquarie) and will therefore be the backbone to its emerging Major Regional Centre status. The location is approximately 40km southwest of Newcastle and approximately 100km north of Sydney.

The site is made up primarily of land which once comprised the Avondale Aerodrome. Surrounding land uses include the existing urban areas of Cooranbong Village to the south, and various rural parcels surrounding the remainder of the site. Varying levels of vegetation cover exist, ranging from pasture to bushland, which can also be found on surrounding lands.

Reference is made to ***Figure 1*** – Location Plan and ***Figure 2*** – Site Plan.

2.2 Land Ownership & Legal Description

The parcel of land being the subject of this Concept Plan / State Significant Site Study, sits in four general areas:

A) Is land controlled by JPG and owned by Australasian Conference Association Ltd.(as trustee for the Seventh-Day Adventist Church)
B) Is land owned and controlled by JPG (through Avondale Greens P/L.
C) Is land is land purchased by JPG for Environmental Offset
D) Is town common land owned by Australasian Conference Association Ltd and proposed to be dedicated to Council.

Reference is made to ***Figure 3*** –Ownership Plan.

Table 1 Lot Ownerships and legal description

Lot	DP	Ownership/Proponent	Area
Area A			
1	595941	Australasian Conference Association Ltd (trustee for the Seventh-day Adventist Church)/Avondale Greens Developments P/L	5.895
11	129156	*As Above*	8.12
12	129157	*As Above*	3.62
20	129159	*As Above*	15.3
1 - 13	7352	*As Above*	17.8

1	3353	*As Above*	28.42
2	3353	*As Above*	27.41
3	3353	*As Above*	20.53
4	3353	*As Above*	19.54
5	3353	*As Above*	8.576
6	3353	*As Above*	18.14
7	3353	*As Above*	18.34
8	3353	*As Above*	19.66
10	3353	*As above*	18.34
1	825266	H. Pocock	27.03
1	170378	Avondale Greens Developments P/L	10.77
2	825266	Dabson	5.056
1	182756	I. & L. Mears/ Avondale Greens Developments P/L	1.383
1	348173	Avondale Greens Pty Ltd.	0.807
212	1037011	Avondale Greens Pty Ltd. (prev. 21//865588)	3.508
Land Subject to Owner's Consent			
A	375386	B & S Porter	2,50914
1	329367	S. & P. Dodson	1.214
14	129157	J. & I. Dabson and M. & A. Dabson	0.809
1	301305	P. & R. Hitchcock	0.809
B	306673	Hunt	0.809
A	306673	D. Sheedy	0.809
13	129157	I. & C. Iselin	1.52
1	346776	L. & D. Volkl	0.722
2	346776	G. Ferguson	0.694
21	129159	D. & M. Batey	0.553
1	360725	J. Vosper	0.15
1	363639	A. & D. Roy	0.354
22	129159	K. Dixon	0.354
3	1029952	I. & G. Wheatley	1.021
2	663728	A. Doncevic	1.234
219	755218	Avondale Greens Pty Ltd.	58.38
Sub-Total Area (ha)			**350.186**
+ Inclusion of the Town Common / Park area			14.58
2	517245	Australasian Conference Association Ltd (trustee for the Seventh-day Adventist Church)/Avondale Greens Developments P/L	
34	736908	Australasian Conference Association Ltd (trustee for the Seventh-day Adventist Church)/Avondale Greens Developments P/L.	
Total Area (Ha)			**364.766**

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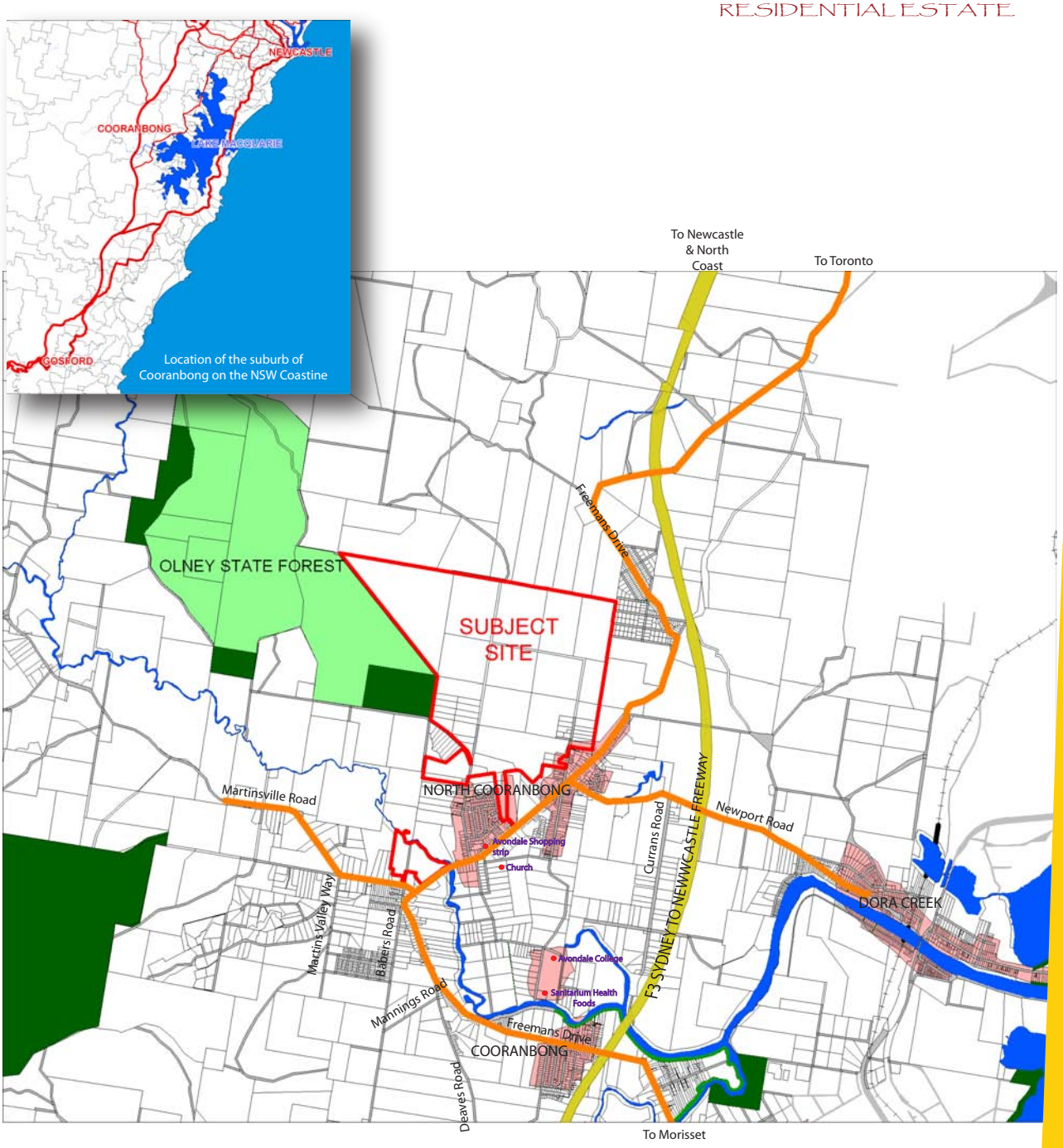

Not to Scale

LOCATION MAP

FIGURE 1

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SITE PLAN

FIGURE 2

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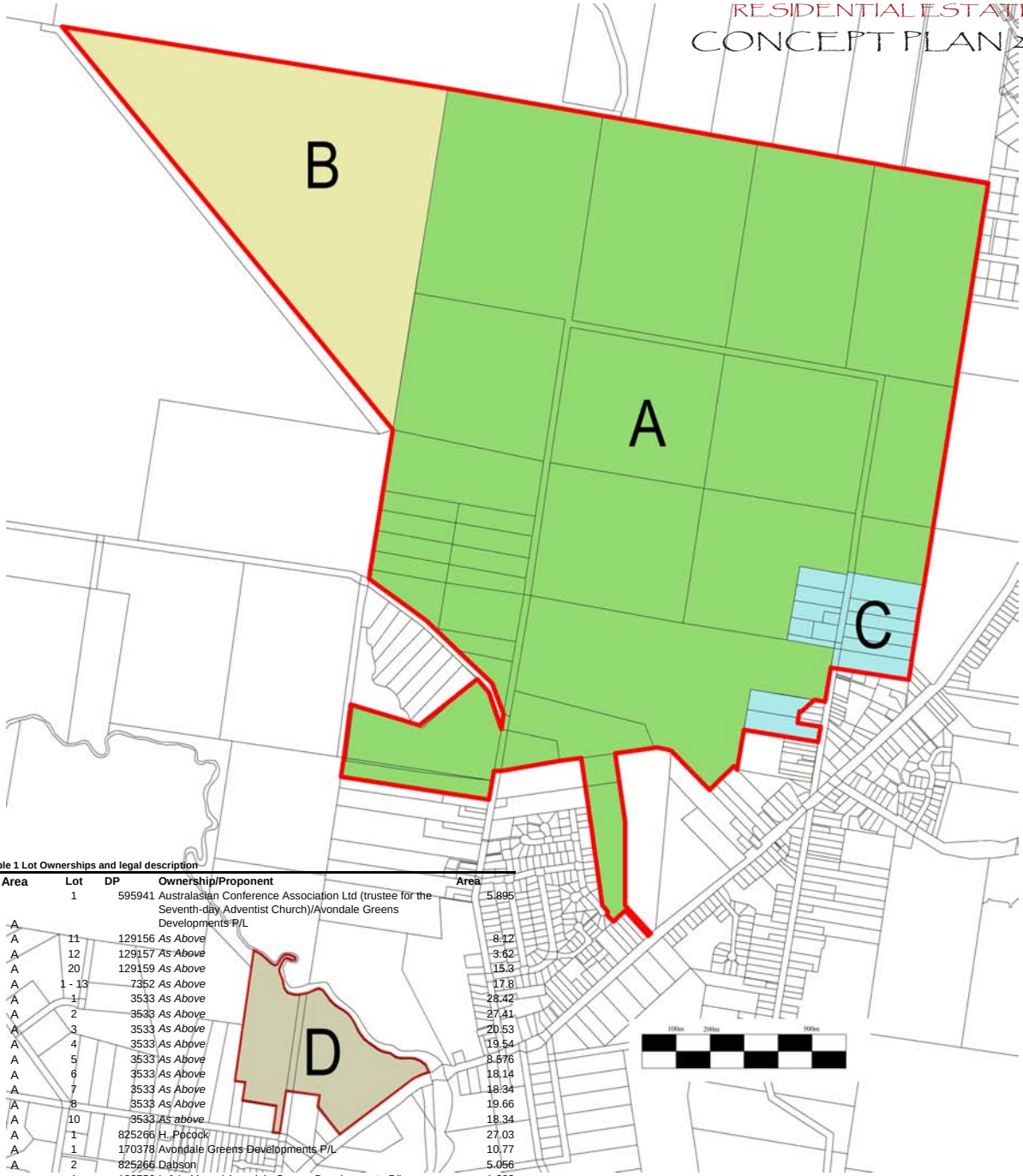
CONCEPT PLAN 2008



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A	2	3533	*As Above*	27.41
A	3	3533	*As Above*	20.53
A	4	3533	*As Above*	19.54
A	5	3533	*As Above*	8.576
A	6	3533	*As Above*	18.14
A	7	3533	*As Above*	18.34
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C	2	663728	A. Doncevic	1.234
B	219	755218	Avondale Greens Pty Ltd.	58.38
	Sub-Total Area (ha)			**350.186**
	+ Inclusion of the Town Common / Park area			14.58
D	2	517245	Australasian Conference Association Ltd (trustee for the Seventh-day Adventist Church)/Avondale Greens Developments P/L	
D	34	736908	Australasian Conference Association Ltd (trustee for the Seventh-day Adventist Church)/Avondale Greens Developments P/L	
Total Area (Ha)				**364.766**

OWNERSHIP PLAN

FIGURE 3

LEGEND

Development Boundary

A - JPG Primary Lands

B - JPG Triangle Lot

C - JWP Lands

D - Town Common (Owned by Avondale College)

HDB TownPlanning&Design

2.3 Existing Development on Site

The site is predominantly vacant, with the former Avondale Air Strip occupying the centre of the site. (Refer ***Figure 2***) To the east, the site includes Avondale School and large lot rural residential development. The large lot rural residential development wraps around the south and south-west portions of the site. The airport was decommissioned and ceased operation on 31 December 2005 and since this time has been vacant. There are a number of hangars and buildings located adjacent to Avondale School which are currently unoccupied.

Northern sections of the site are wooded with a light understorey occupying the highest portions of the site with commanding views of surrounding escarpments.

Existing runway areas have been cleared. There are a number of drainage corridors and drainage ditches in this area, both natural and man made.

The east of the site and near the end of the main runway has previously been cleared to create an area of east facing sloping land with distant views. The land within the school site has been modified to create level sporting fields and large detention ponds. The school buildings sit on level pads occupying the southern sections of the site. The site generally rises to the north.

South-east portions of the site adjoin Avondale Road and the existing village of Cooranbong. This area is predominantly cleared and used for rural residential purposes.

Areas to the north and south of Alton Road has been cleared and used for rural activities.

The majority of the site is currently vacant.

Reference is made to ***Figure 4*** – Aerial Site Photograph.

AERIAL SITE PHOTOGRAPHS

FIGURE 4

2.4 Surrounding Development

The site is adjoined to the south by the existing residential areas of Cooranbong and the Avondale Shopping Village. This area reflects conventional single dwelling housing with a scattering of larger lots. The western boundary of the site adjoins the Olney State Forest with the Watagan State Forest located to the north-west of the site. (Refer ***Figure 1***)

Small rural land holdings adjoin on the south-west corner of the site and are predominantly used for rural residential activities. The Avondale School forms part of the site to the north-east, together with rural residential and large lot rural along the eastern boundary.

The density of development generally increases south along Avondale Road towards the Avondale Shopping Village.

Cooranbong is the centre for the Australasian Conference of the Seventh Day Adventist Church. The Avondale School caters for children from pre-school age through to year 12. The Avondale College is located south of the Cooranbong Avondale Shopping Village, which adjoins the Sanitarium Health Foods Complex together with the Seventh Day Adventist Churches.

It is important to note that the Avondale College is currently attempting to achieve university status. An application is currently being considered by the relevant authorities. The proposed concept plan would assist the college in attaining this status by providing an increase in local population, housing and services to support a university campus.

The Seventh Day Adventist complex includes a College; Sanitarium facilities, including student accommodation; a nursing home; hostels and retirement village. It also includes a small operating dairy, some agricultural lands and educational support facilities of the College, including the infrastructure and administrative requirements for the Sanitarium Health Foods operation all in the Cooranbong locality.

2.5 Site History

“Cooranbong”, the name of the settlement, comes from the Aboriginal word Kour-an-bong meaning rocky bottom creek or water over rocks. Cooranbong was the place where a number of clashes occured between Aboriginal groups as groups outside of the area tried to access the lake.

In 1826 Lieutenant Percy Simpson selected 2,000 acres at Cooranbong and took up residence in the Kourunbung Homestead located near the Roman Catholic Church. In August 1861, seven lots were sold adjoining the western boundary of Simpson's grant. This started the village centre and the town of Cooranbong developed from this day. The town itself came into existence at this time (1861).

The first Catholic Church was erected in 1861 and in 1866 a bridge was erected over Dora Creek. By 1865 the town had a population of 150 residents, which was primarily related to the timber industry.

The location of the town was predicated by the existence of Dora Creek, which gave access to the lake, the existence of a fiord, which enabled crossing of the creek and the surrounding good timber supplies.

In 1874 the Robert King's sawmill exported its first cargo of timber, which lead to the establishment of two more sawmills in 1877.

In 1884 the population had grown to 700 with fishing and ship building being the early supporting industries.

In 1890 due to national economic depression and the end of the railway contract, the population dropped to 206 people. The Cooranbong area was bypassed by the Newcastle to Sydney rail line, with the construction of a rail station at Morisset, Morisset grew to be the regional centre. Further to this Cooranbong lost its port status due to the construction of the rail bridge over Dora Creek, which was too low to allow access to the Lake.

In the late 1890's the Seventh Day Adventist established the Sanitarium Health Food Company and the Avondale College. As timber declined as an employment base, the growth of the Avondale College took over as a focus for the Cooranbong area.

By the 1900's the college had developed to include large two and three storey buildings and a number of smaller cottages.

The Sanitarium Health Food Company began in 1898 in an old sawmill building at Cooranbong. The Sanitarium Health Food Company has developed into a major company and now employs some 1,700 people across Australia and New Zealand with an annual turnover of $300 million. The Cooranbong site is one of the largest cereal production plants in the southern hemisphere.

The Avondale College currently offers undergraduate courses in arts, education, nursing, business, science and theology and postgraduate courses in education,

leadership and management, nursing, theology and ministry and vocational education and training courses in business and outdoor recreation and English language courses for oversees students. In 2003 the college had 930 students with supporting recreational, health and fitness centres, including auditoriums, heated outdoor swimming pools, tennis courts and playing fields.

2.6 Site Analysis

2.6.1 Topography, Slope & Aspect

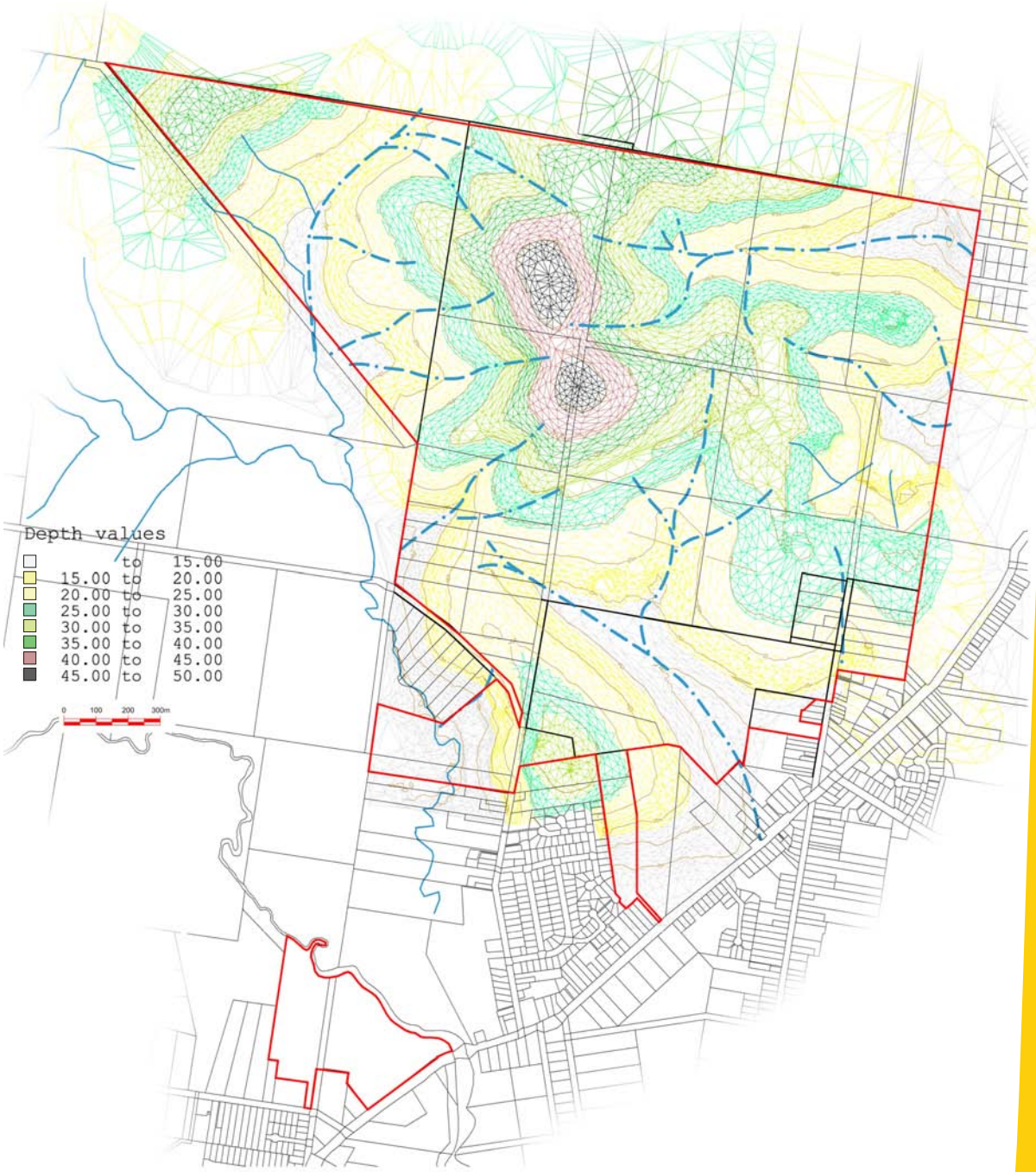
The Cooranbong area is generally low lying with the exception of the subject site, which is dominated by a ridgeline running south to north towards the adjoining Mt Cooranbong. The subject site is relatively gently undulating, ranging in elevation from 5m to 45m AHD. ***Figure 5*** – Topography Plan shows the topography of the site at 1m contour intervals. Ridgelines are defined on the plan and are dominated by three distinctive knolls, one on the southern section of the site and two within the centre of the site, each occupying prominent view points in the topography. A number of spurs run east and west of the main ridgeline.

Figure 6 relates to Slope Analysis of the site and shows that the site predominantly has between 0 - 5º slope with some minor areas at 5 – 10º. There are no areas above 15º and areas relating to 10 - 15º slope are generally sites of disturbance, dams walls, etc, on the site.

2.6.2 Hydrology

A number of first order streams in the form of depressions with no defined banks sitting in between the ridgelines running east and south on the site. These drain predominantly to two drainage systems on the west and east of the main ridgeline, ultimately feeding into Dora Creek. Existing hydrology and drainage patterns are shown on ***Figure 7*** – Hydrology Plan.

Flooding in respect to the 1% AEP is generally confined to the existing defined creek systems as shown in ***Figures 5 and 7***. This is further examined in the flood and drainage report ***Appendix Q***.



TOPOGRAPHY PLAN

FIGURE 5

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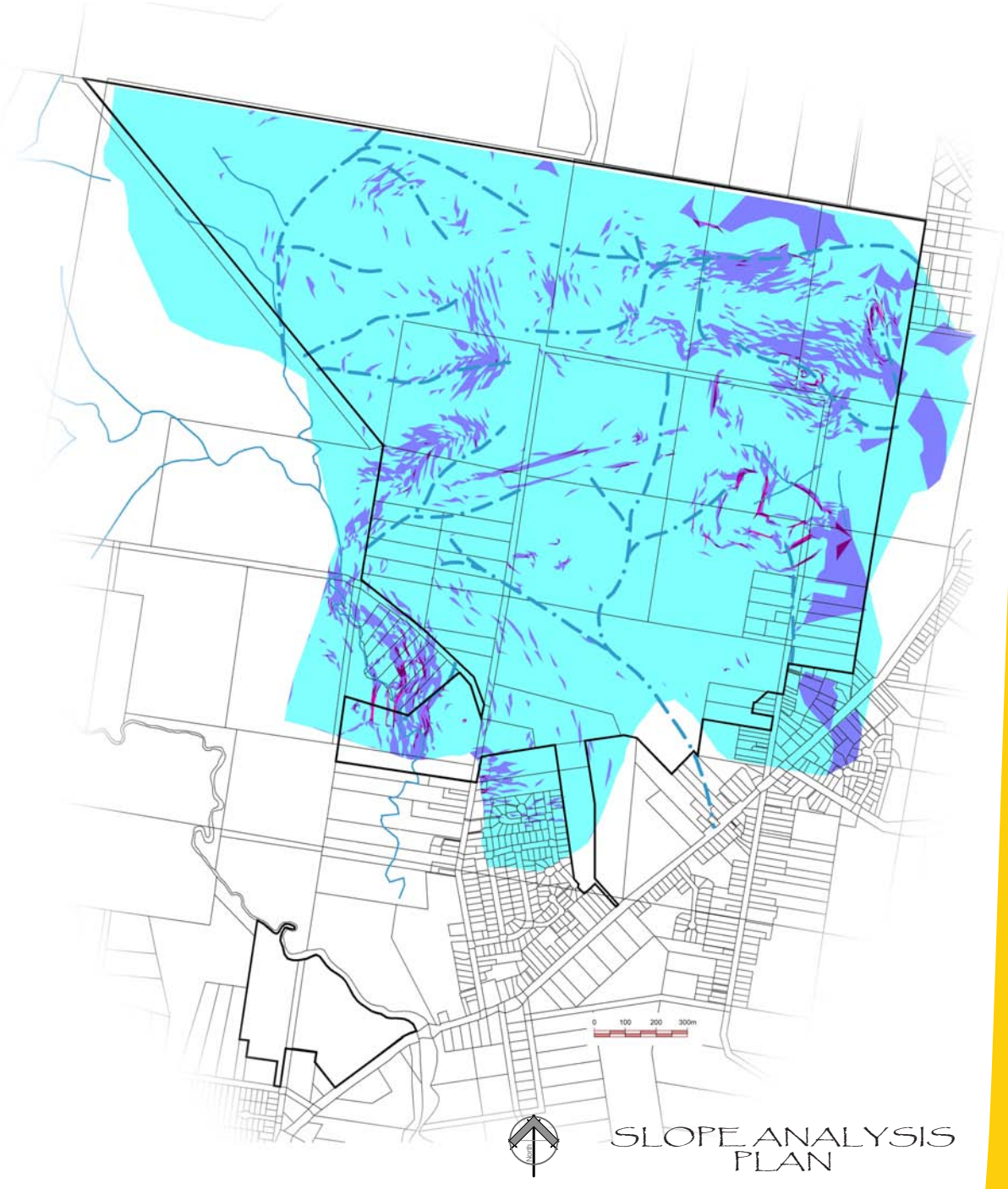

SLOPE ANALYSIS PLAN

FIGURE 6

- 0 - 5 Degrees Slope
- 5 - 10 Degrees Slope
- 10 - 15 Degrees Slope
- 15 - 20 Degrees Slope
- 20 < Degrees Slope

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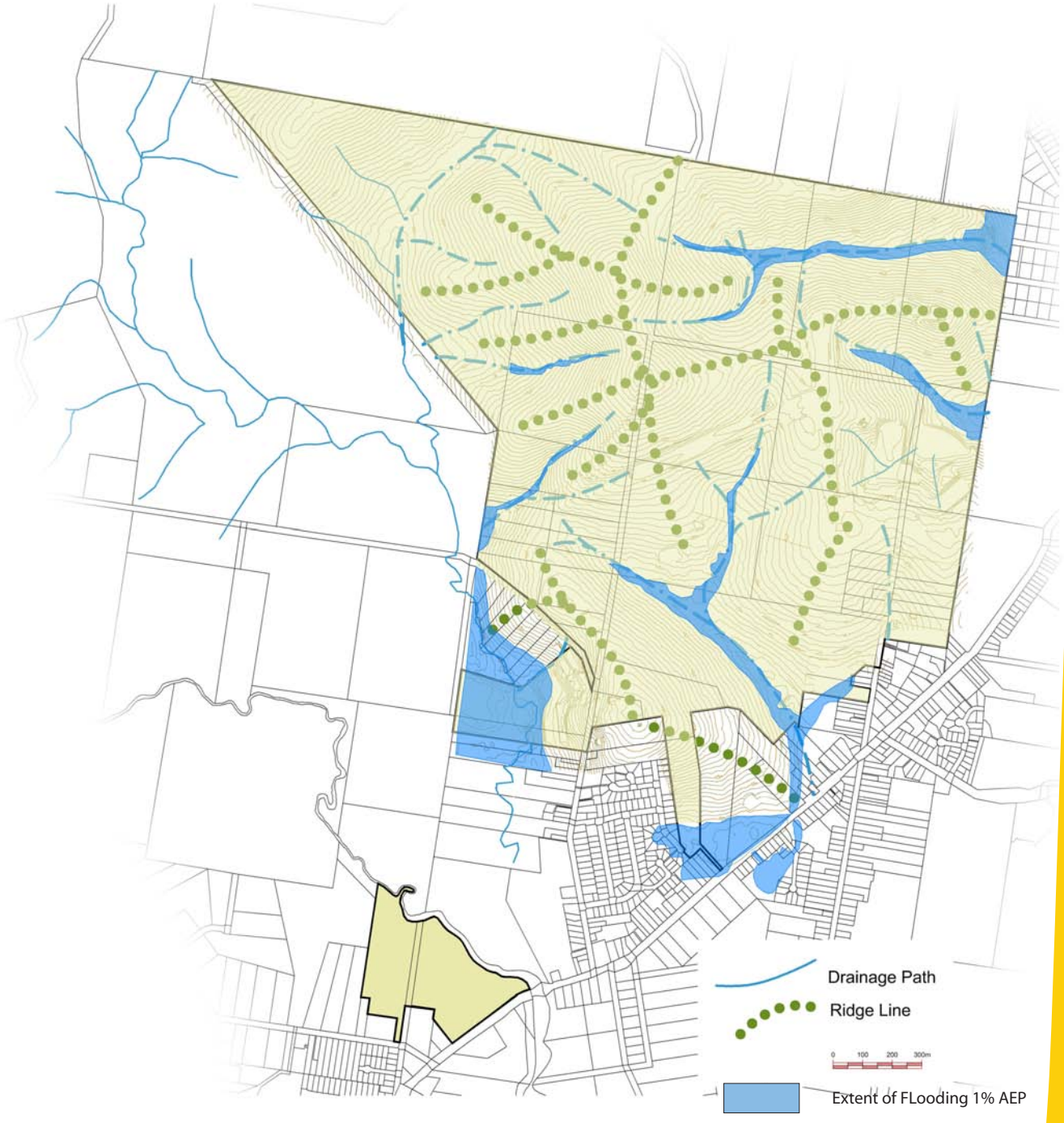

HYDROLOGY PLAN

FIGURE 7

HDB
TownPlanning&Design

2.6.3 Geology

Douglas Partners Pty Ltd prepared a Geotechnical Assessment of the subject site, refer ***Appendix A***. In relation to geology, the site is underlain by the Triassic aged Narrabeen Group, generally comprising chert sandstone, quartzose sandstone, conglomerate, shale and claystone. A shallow soil profile was generally observed with silty topsoil overlying sandy clay and silty clay soils. Sandstone outcrops were observed at the base of some erosion scours.

The implications for the proposal as a result of the geology of the site are as follows:

- soils should be able to be readily excavated by conventional earthmoving equipment
- detailed investigations should be made prior to development to confirm specific excavation conditions in each area
- geology does not constrain development.

2.6.4 Vegetation

Vegetation studies have been conducted on this site since JPG first became involved in the development in 2000. Studies previously conducted, and which forms part of this submission, have analyzed the existing vegetation communities with respect to the relevant legislative framework. Detailed flora assessments are attached as appendices.

In summary, flora assessments found the following vegetation on the site:

- A total of 312 species (263 native and 49 exotic) were recorded as part of the site flora assessment.
- Four (4) vegetation communities were identified on the site:
    - Coastal Plains Smoothbarked Apple Woodland,
    - Coastal Plains Scribbly Gum Woodland,
    - Riparian Melaleuca Swamp Sclerophyll Woodland, and
    - Alluvial Tall Moist Forest.
- One endangered community listed under the TSC Act was recorded on the site:
    - Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions.
- Three species listed on the EPBC Act and the TSA Act were recorded on the site:
    - *Angophora inopina* - Charmhaven Apple,
    - *Grevillea paviflora* subsp. *Paviflora* – Small Flower Grevillea, and
    - *Tetratheca juncea* – Tetratheca.
- Three species of regional conservation significance were recorded on the site:

- *Blandfordia grnadiflora,*
- *Hakea bakeriana,* and
- *Tetratheca juncea*

- One noxious weed as classified for the Lake Macquarie LGA was recorded on site as being *Ageratina adenophora.*

Reference is made to ***Figure 8*** Vegetation Plan, which was referred to in the flora report and is an extract from the LHCCREMS(2003).

A further study was undertaken on adjacent land at that time (refer Area B on ***Figure 3***) which was proposed for compensatory habitat. The land suitable for this purpose was defined and incorporated into the Concept Plan, refer ***Appendix B(ii)***

Following further discussions with the DEWHA, a further targeted study was carried out in February 2008 in respect to *Angophora inopina*, *Grevillea paviflora*, and
Tetratheca juncea. The findings of these studies are represented in ***Appendix B(iii).*** Further review was requested by local environmental consultancy *Harper Somers O'Sullivan (HSO)* as to the distribution of these plants in the region. The HSO report investigated the distribution of these plants on a regional base.

In addition to fauna in respect to the main site, HSO was engaged to examine the ecological state of the Town Common Site. Again the results of this study is included as an appendix, ***Appendix B(ii).*** While no threatened species were found on this site vegetation quality was generally good adding value to the conservation of part of this site under the Concept Plan.

2.6.5 Fauna

Baseline fauna studies have been conducted on this site since JPG first became involved in the development in 2000. Studies previously conducted, and which forms part of this submission, have analyzed the existing fauna communities with respect to the relevant legislative framework.

Austeco Pty Ltd undertook a site specific fauna assessment of the subject site to provide baseline data on the fauna of the site. The report concluded that 15 threatened species were either on the site, likely to be on the site (due to potential habitat) or possible to frequent the site. **Table 5** lists these species, their presence or likelihood of being present, and micro and macro habitats.

Table 5 – Threatened Fauna Source: Austeco 2004

Threatened Species	Macrohabitats*	Microhabitats	Present
Glossy Black Cockatoo Calyptorhynchus lathami	DSF, WSF,SF	Large hollows Casuarinas	present
Swift Parrot Lathamus discolor	SF	Swamp Mahogany	likely
Regent Honeyeater Xanthomyza phyrigia	SF	Swamp Mahogany	likely
Powerful Owl Ninox strenua	WSF, SF, DSF,	Large tree hollows	likely
Masked Owl Tyto novaehollandiae	WSF, SF, DSF,	Large tree hollows	likely
Spotted-tailed Quoll Dasyurus maculatus	WSF, DSF, SF		likely
Koala Phascolarctos cinereus	WSF, DSF, SF	Food Trees Mature forest	possible
Squirrel Glider Petaurus norfolcensis	SF, DSF	Medium hollows Banksia spp. Swamp Mahogany Red Bloodwood	possible
Grey-headed Flying Fox Pteropus poliocephalus	SF	Swamp Mahogany	present
East-coast Free-tailed Bat Mormopterus norfolkensis	WSF, DSF, SF	Small hollows	present
Little Bent-wing Bat Miniopterus australis	WSF, DSF, SF	Small hollows	present
Eastern Bent-wing Bat Miniopterus schreibersii oceanensis	WSF, DSF, SF	All hollows	present
Large-footed Myotis Myotis adversus	WSF SF	All hollows	present
Greater Broad-nosed Bat Scoteanax rueppellii	WSF, DSF, SF	Small hollows	present
Green-thighed Frog Litoria brevipalmata	WSF,SF	Riparian Forest Swamp Forest	likely

**WSF – Wet Sclerophyll Forest*
DSF – Dry Sclerophyll Forest
SF – Sclerophyll Forest

The HSO report relating to the fauna of the Town Common site potential habitat for potentially significant fauna. The Concept Plan maximises the conservation of quality habitat on this site as can be seen by the dedication of part of the site under ecological zonings.

2.6.6 Access and Transport

The local transport system is dominated by the F3 Freeway (Sydney to Newcastle Freeway) which runs in a north south direction approximately 800m from the eastern boundary of the subject site (refer ***Figure 9***). In addition to this the major arterial road for local traffic is Freeman's Drive which runs parallel with the F3, between the subject site and the F3. Freeman's Drive connects to the subject site via Avondale Road. Traveling south, Freeman's Drive connects the subject site to the existing area of Cooranbong and further to Morisset.

The nearest rail station to the subject site is the Dora Creek station closely followed by Morisset station which are both located on the Sydney-Newcastle line. Multiple services arrive and depart the stations daily traveling both north towards Newcastle, and south towards the Central Coast and Sydney. Services which may pass through Dora Creek Station will usually stop at Morisset due to its higher station hierarchy status.

Morisset Buses runs a regular service between Cooranbong and Morisset, route 280, refer ***Figure 9***.

Appendix R(i) is a technical document prepared by GHD and Better Transport Futures. The existing access and transport facilities servicing the subject site are briefly outlined as follows. In addition a T-Map has been completed in negotiations with the Ministry of Transport and is attached ***Appendix R(ii)***.

Road Access

The following describes the existing road network within Cooranbong and surrounding areas. This network is shown on ***Figure 9***. The existing road network within the study area comprises the following traffic management features:

Stop-sign control

- Alton Road onto Freeman's Drive
- Central Road onto Freeman's Drive
- Other intersections generally operate under give-way sign control

Freeman's Drive

Freeman's Drive was previously designed as a main road under the Roads and Traffic Authority hierarchy classification prior to the construction of the Sydney – Newcastle Freeway. After the Freeway was constructed, Freeman's Drive was re-classified as a local road under the care and control of LMCC. Freeman's Drive performs the function of a sub-arterial road providing secondary inter-regional links between Cooranbong and Morisset. Freeman's Drive also provides access to the Mandalong Road interchange on the F3 Freeway.

Through, this Cooranbong typically has a 14.8m wide sealed carriageway, which incorporates two travel lanes, one in either direction and has available area to accommodate on-street parking on either side of the road. The speed environment along Freeman's Drive is 80km/hr in areas that are rural in character and reduces to 60km/hr through urban centres such as Cooranbong.

Alton Road

This road is classified as a local road under the care and control of LMCC. This road link is connected to Freeman's Drive at its southern end and terminates to the north at Olney State Forest. Alton Road performs the function of a local/collector road providing access to urban and rural type residential and commercial properties. The sign posted speed limit along Alton Road is 50km/hr.

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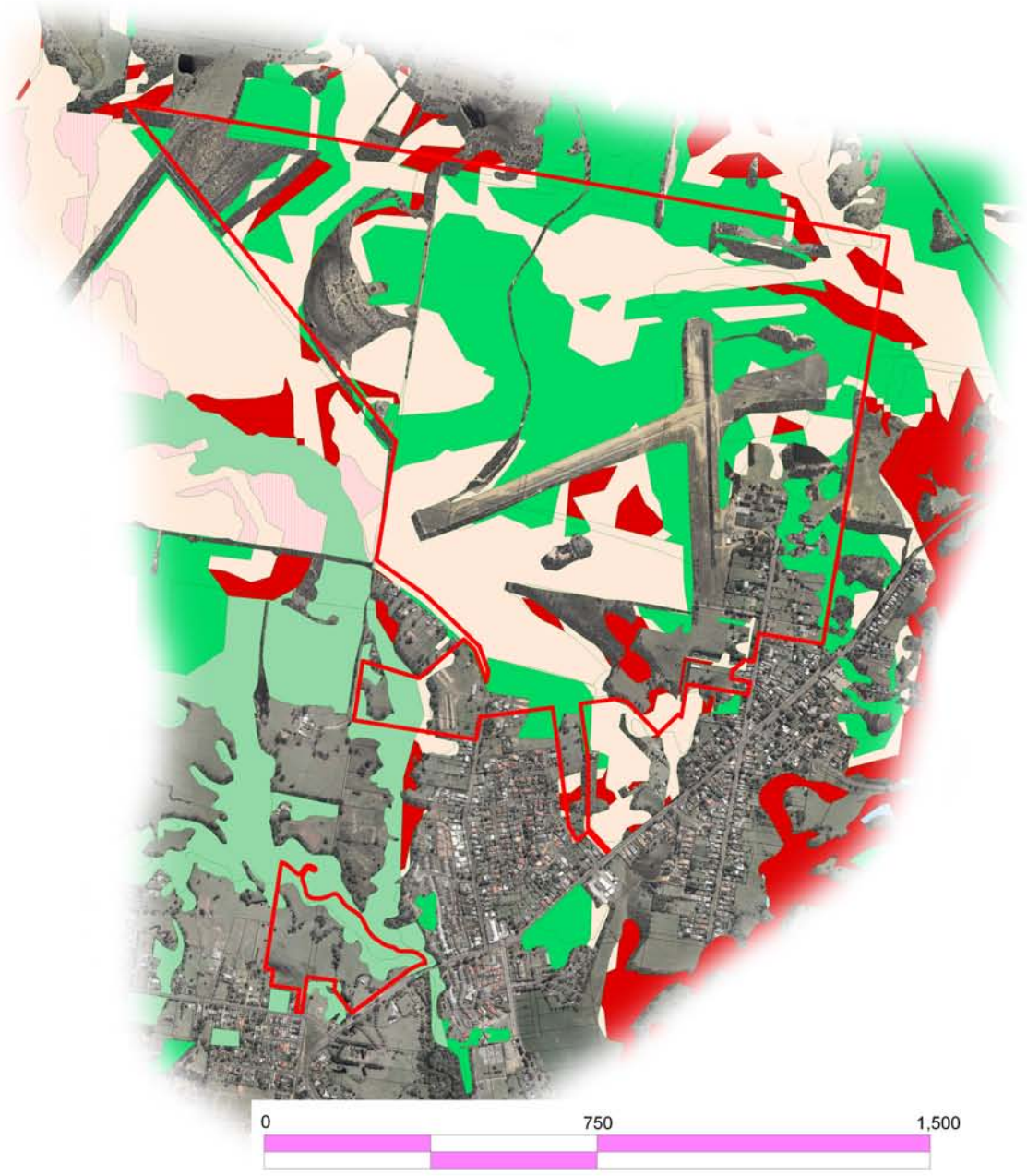
NORTH COORANBONG
RESIDENTIAL ESTATE
CONCEPT PLAN 2008



LEGEND

- Coastal Plains Scribbly Gum Woodland
- Coastal Plains Smooth-barked Apple Woodland
- Riparian Melaleuca Swamp Woodland
- Redgum Rough Barked Apple Forest
- Swamp Oak Rushland Forest
- Mangrove-Estuarine Complex
- Water
- Swamp Oak Sedge Forest
- Swamp Mahogany - Paperbark Forest
- Rushland
- Melaleuca Scrub
- Coastal Foothills Spotted Gum - Ironbark Forest
- Coastal Ranges Open Forest
- Coastal Sand Apple - Blackbutt orest
- Coastal Wet Gully Forest
- Coastal Narrabeen Moist Forest
- Coastal Warm Temperate- Subtropical Rainforest
- Alluvial Tall Moist Forest

FLORA & FAUNA CONSTRAINTS PLAN

FIGURE 8

LHCCREMS (2003) Vegetation Mappping

HDB TownPlanning&Design

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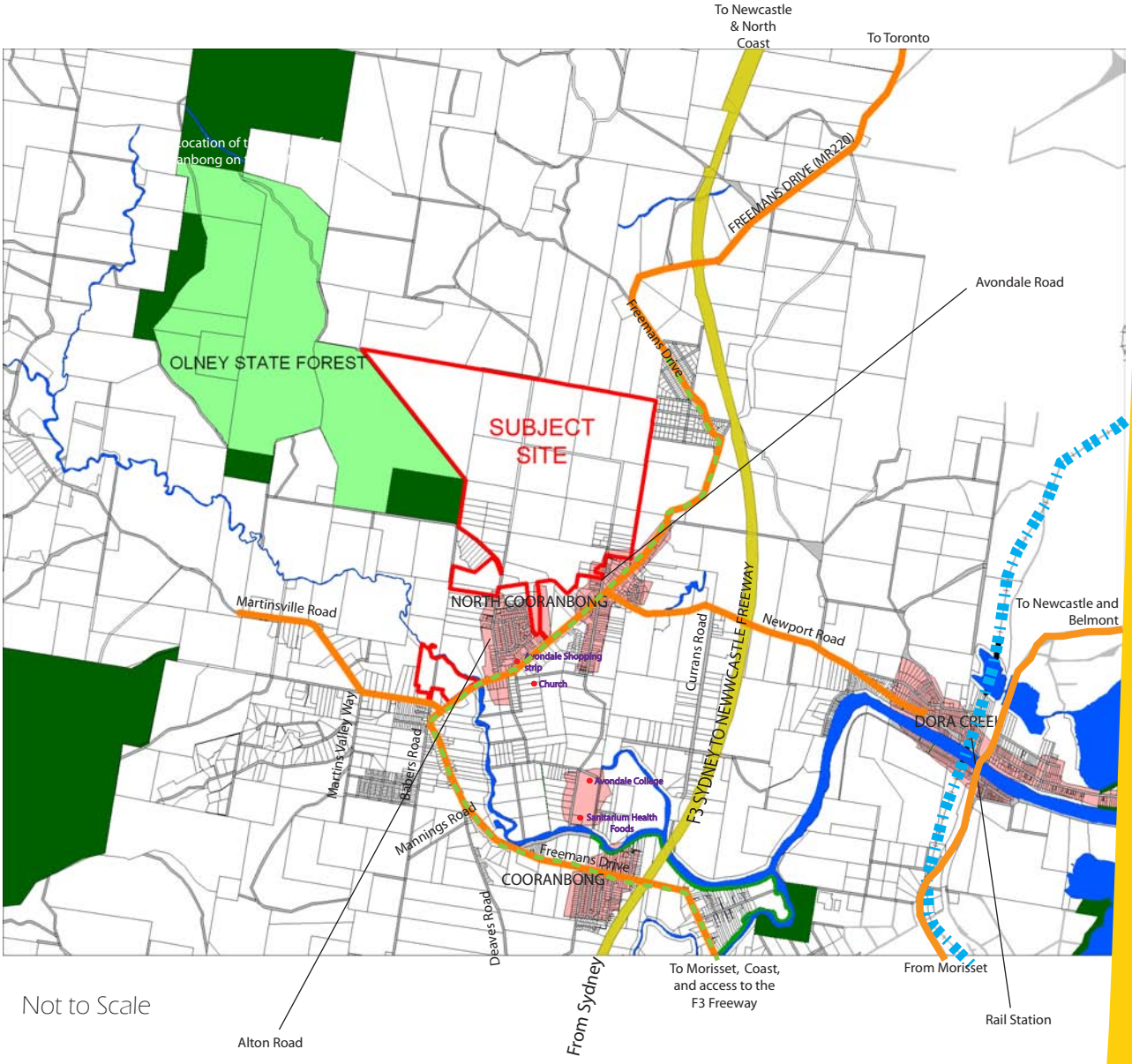
RESIDENTIAL ESTATE



Not to Scale

Subject Site Boundary

Bus Route 280 (Morisset - Cooranbong - Avondale

Main Northern Railway Sydney to Newcastle

Roads

F3 Sydney - Newcastle Freeway

EXISTING TRANSPORT PLAN

FIGURE 9

HDB Town Planning & Design

Avondale Road

Avondale Road is classified as a local road under the care and control of LMCC and is sign posted at 50km/hr (40km/hr during school hours). The road has a north south alignment and forms an irregular four way intersection with Freeman's Drive, approximately 1.2km north-west of the centre of Cooranbong.

Newport Road

Newport Road performs the function of a collector road, providing connection to both the urban centres of Dora Creek and Cooranbong. The road intersects with Freeman's Drive in the west and Macquarie Road in the east and services a number of local residential roads in Dora Creek.

Rail Services

Cooranbong is located near two railway stations (Morisset and Dora Creek) which are serviced by regional type rail services. Dora Creek is situated approximately 4km east of the site and currently has the capacity to offer a park and ride opportunity with rail. Morisset is located approximately 6km south east of the site and offers and higher frequency train service, district facilities and bus connections. Morisset Station has disabled access and a large commuter carpark.

Bus Services

Cooranbong is currently serviced by Morisset Bus Company which operates along the Freeman's Drive Corridor, linking Cooranbong with Morisset (Route No. 280). The 280 Timetable currently offers approximately 10 services in each direction per day. This service does not operate on weekends and is designed to connect with the train timetable at Morisset Train Station.

Bicycle and Pedestrian Networks

Currently Cooranbong and the surrounding areas are rural / residential in character and as such there is little in the form of pedestrian and cycling infrastructure to support or encourage these forms of travel. The general layout of Cooranbong is scattered along three road links covering an approximate distance of between 2km and 3km. The majority of the population travel to work by car.

A number of sealed footpaths have been provided around Cooranbong shopping area, which is situated at the intersection of Freeman's Drive and Alton Road. Pedestrian access across Freeman's Drive is facilitated by a pedestrian refuge which is situated between the Cooranbong shops located on the north-western side of Freeman's Drive and Central Road. Central Road is located to the south of Freeman's Drive and services Avondale School and one of three retirement villages situated in the Cooranbong area.

There are no apparent cycling routes in the area. However, the area presents a good opportunity to provide on and off-road cycle routes, given the available road and reservations, local attractions and relatively flat terrain. Networks show in the ***Appendix R,*** have been agreed to with LMCC and are outlined in a voluntary planning agreement.

2.6.7 Existing Services

Appendix D contains letters from Utility Service providers and ***Appendix I*** contains the North Cooranbong Bulk Water and Wastewater Servicing Study, prepared by *Patterson Britton & Partners*. The existing services to the subject site are briefly outlined as follows.

Water

The North Cooranbong area is situated within the Hunter Water Corporation's Water Supply Developer Servicing Plan area for Wangi and is serviced by the Morisset – Wyee Water Supply System. This water supply system is located entirely within the Lake Macquarie Council LGA and provides water to several townships in south-western Lake Macquarie including Wyee, Morisset, Cooranbong, Avondale, Dora Creek, Mirrabooka, Eraring and Wangi.

The Morisset – Wyee Water Supply System is supplied by the Wangi Reservoir which is filled from the South Wallsend Reservoir by the Wallsend Water Pumping Station. From the Wangi Reservoir, water flows south under gravity to Dora Creek via two trunk water mains.

At the Dora Creek Bridge the trunk mains divert water west along Newport Road to the Dora Creek Reservoir. This reservoir serves to provide water to the western areas of Dora Creek, Cooranbong and surrounds. Refer ***Figure 10*** – Water Supply Schematic.

Wastewater

The North Cooranbong area is situated within the Hunter Water Corporation's wastewater Developer Servicing Plan for Dora Creek. The wastewater transportation system is located entirely within the LMCC LGA and services the townships of Wyee Point, Morisset, Cooranbong, Dora Creek, Bonnells Bay, Yarrawonga Park, Silverwater, Sunshine and Brightwaters.

The Dora Creek wastewater transportation system is a conventional gravity system consisting of gravity trunk mains, WWPS's and rising mains. Wastewater produced from the catchment is ultimately transported to the Dora Creek WWTW, which is located approximately 5km to the south-east of the subject site.

Wastewater from the North Cooranbong area currently drains in a southerly direction along Freeman's Drive via a series of WWPS's and rising mains to

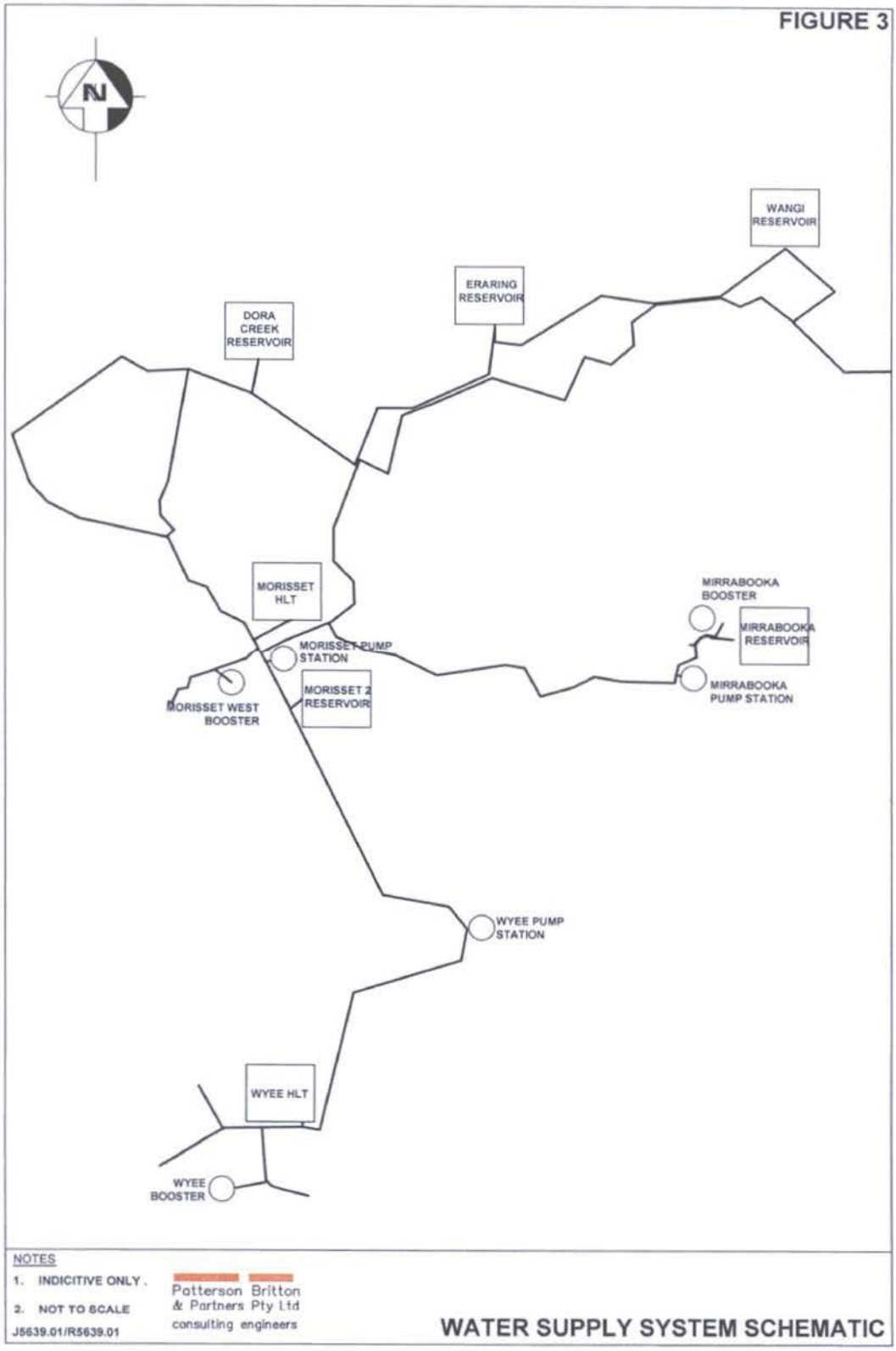
western Morisset. The wastewater is then directed through additional WWPS's and rising mains in Morisset, before being delivered to the Dora Creek WWTW.

Refer ***Figure 11*** – Wastewater Servicing

Electricity
Correspondence was received from *Energy Australia* dated 24th September, 2004 notes that there is sufficient supply for the North Cooranbong proposal. There is three phase high voltage 11kv supply available in Freeman's Drive, Alton Road and Avondale Road Cooranbong, which surrounds the subject site. (Refer ***Appendix B***)

Communications
The site is located in close proximity to the existing village of Cooranbong and it is considered that the site will have access to a suitable telecommunications network.

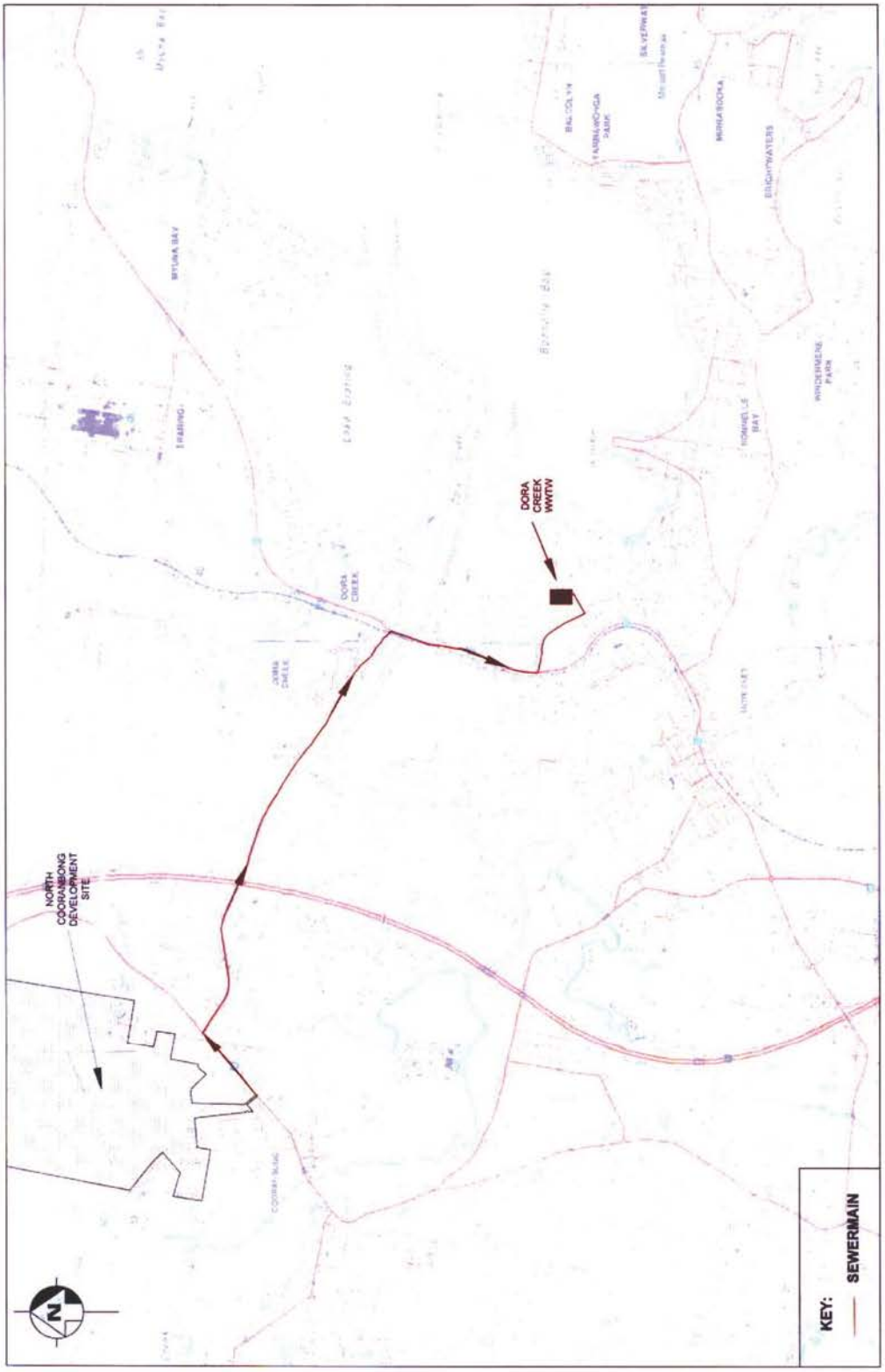
Natural Gas
Correspondence was received from Agility Energy dated 7th September, 2004 which notes that natural gas is available in the vicinity and can be extended to supply the North Cooranbong proposal.



WATER SUPPLY SCHEMATIC

FIGURE 10

FIGURE 9



WASTE WATER
SERVICING

FIGURE 11

3.0 PLANNING FRAMEWORK & CONTEXT

This Concept Plan for the North Cooranbong site is submitted under Part 3A of the EP&A Act 1979.

To demonstrate the ability of the proposal to meet the requirements of environmental legislation, regulations, policies and controls the following section will address relevant planning legislation as it applies to the subject site.

3.1 Commonwealth Legislation EPBC Act 1999

The EPBC Act 1999 requires Federal Government approval for developments (actions) which are classified as 'controlled actions' under this Act. Controlled Actions are those which, under the auspices of the EPBC Act will have a significant impact on a 'matter of national environmental significance'. In relation to the subject proposal such significant impact would occur if the site were to contain, or the proposal were to affect, threatened species, ecological communities or migratory species listed under the Act.

As a result of previous site investigations in relation to flora and fauna, a significant body of information has been accumulated for the site. The ecology reports conducted over these years found a number of species to be listed as endangered or vulnerable under the EPBC Act 1999. These species include the:

Fauna

- *Lathamus discolor* - Swift Parrot,
- *Xanthomyza phrygia* - Regent Honeyeater, and
- *Pteropus poliocephalus* - Grey-headed Flying Fox.

All of these species fall within the Swamp Mahogany (winter nectar feeding) Guild. The following flora found on site are listed as endangered or vulnerable under the EPBC Act 1999.

Flora

- *Grevillea. parviflora* R. Br. Subspecies *parviflora* – Small Flower Grevillea
- *Tetratheca juncea* – Tetratheca
- *Angophora inopina* – Charmhaven Apple

Two listed migratory species have been reported to occur on the site or have been spotted while traversing the site:

- *Aredea ibis* - Cattle Egret; and
- *Scythrops novaehollandiae* - Channel Billed Cuckoo

(Harper Somers 2002a.b, Harper Somers O'Sullivan 2002,2003).

Reference is made to ***Appendix B*** – Flora Vegetation Study and ***Appendix C*** – Cooranbong Fauna Constraints Assessment – Refer ***Figure 8***.

These species may be considered transient or vagrant as no suitable, long term seasonal foraging habitat for either species is present on the Site.

In May of 2007 the Commonwealth and NSW Governments signed a bilateral agreement which certified the NSW planning process under the Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act). This meant actions that have been deemed 'controlled' under the EPBC Act by the Federal Minister for Environment, Water, Heritage and the Arts can be assessed under the Environmental Planning and Assessment Act 1979 without the need for concurrent environmental assessments by both State and Commonwealth Governments.

As the concept design will impact on federally listed threatened species, a preliminary assessment application was made to the Commonwealth Department of Environment and Water Resources to determine if the proposal can be considered a controlled action. In a letter dated the 17th December 2007 **(*Appendix E)***, from the Department of Environment, Water, Heritage and the Arts, the project was deemed a 'Controlled Action'. As such the project will be assessed under the NSW Bilateral Agreement with a requirement for project approval from the Australian Government.

In order to satisfy the environmental assessment requirements of the Department of Environment, Water, Heritage and the Arts, two documents where obtained outlining the:

(i) *Guidelines,* and
(ii) Specific matters

which must be addressed in relation to the EPBC Act 1999. The following is a summary of where relevant information may be found to satisfy these requirements. Where sufficient information does not currently exist these requirements are addressed;

Guidelines on EPBC Act Matters

1. General information

The background of the action including:

(a) the title of the action	North Cooranbong Part 3A Concept Plan Application
(b) the full name and postal address of the designated proponent	Refer to the Executive Summary

	of this report.
(c) a clear outline of the objective of the action	See Section 5.0.
(d) the location of the action	Refer Figure 1 Location Plan.
(e) the background to the development of the action	See Section 1.2.
(f) how the action relates to any other action (of which the proponent should be reasonably aware) that have been or are being, taken or that have been approved in the region affected by the action	No other actions will be effected by this action.
(g) the current status of the action	The action is currently seeking an assessment outcome from the NSW Department of Planning (correct at date of printing)
(h) the consequences of not proceeding with the action	See Section 9.6.

2. Description of the controlled action

A description of the controlled action including:

(a) all the components of the action	See Section 5.0.
(b) the precise location of any works to be undertaken, structures to be built or elements of the action that may have relevant impact	See Section 5.0.
(c)how the works are to be undertaken and design parameters for those aspects of the structures or elements of the action that may have relevant impacts	See Section 5.3.
(d) to the extent reasonability practicable, a description of any feasible alternatives to the controlled action that have been identified through the assessment and their likely impact including:	See Section 9.5.
(i) if relevant the alternative of taking no action	See Section 9.5.1.
(ii) a comparative description of the impacts of each alternative on the matter protected by the controlling provisions for the action	See Sections 7.3.3 and 9.5.
(iii) Sufficient detail to make clear why any alternative is preferred to another.	See Section 9.5.

3. A description of the relevant impacts of the controlled action

An assessment of all relevant impacts that the controlled action has, will have, or is likely to have on:

(a) threatened ecological communities and threatened	See section 7.3.

species potentially present and listed under sections 18 and 18A of the EPBC Act	
(b) migratory species listed under the EPBC Act	None will be effected. Refer Sections 3.1 and 7.3
(c)RAMSAR wetlands	
(d) places listed on the National Heritage list protected under the EPBC Act.	
(e) World Heritage areas	

4. Proposed safeguards and mitigation measures

A description of feasible mitigation measures, changes to the controlled action or procedures, which have been proposed by the proponent or suggested in public submissions, and which are intended to prevent or minimise relevant impacts. Information must include:

Details of proposed safeguards and mitigation measures are outlined in Section 7.3. In addition to urban design and onsite conservation offsets, offsite conservation offsets are to be provided. Negotiations are currently underway between the proponent and the DECC to determine the level of contribution to ensure that the improve or maintain principle will be met, therefore mitigating the effects of the proposal on the listed species.

(a) a description, and an assessment of the expected or predicted effectiveness of, the mitigation measures;	Refer Section 7.3 and *Appendix B(iii)*
(b) Any statutory or policy basis for the mitigation measures;	Mitigation measures are based on the requirements of the DECC and ecologists recommendations
(c) the cost of the mitigation measures;	Total cost is unknown as negotiations in relation to a monetary contribution are ongoing.
(d) an outline of an environmental management plan that sets out the framework for continuing management, mitigation and monitoring programs for the relevant impacts of the action, including any provisions for independent environmental auditing;	Ongoing monitoring and management will be subject to the requirements of the DECC. Rfer Section 8.0.
(e) the name of the agency responsible for endorsing or approving each mitigation measure or monitoring program;	NSW DECC

(f) a consolidated list of mitigation measures proposed to be undertaken to prevent, minimise or compensate for the relevant impacts of the action, including mitigation measures proposed to be taken by State governments, local governments or the proponent.	Refer Section 7.3.2

5. Other approvals and conditions

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

(a) details of any local or State government planning scheme, or plan or policy under any local or State government planning system that deals with the proposed action, including:	Ongoing negotiation between the proponent and the DECC aim to provide a monetary contribution for the provision of offsite conservation areas to demonstrate the maintain or improve principle. The final details are to be included in the relevant Regional Voluntary Planning Agreement
(i) what environmental assessment of the proposed action has been, or is being, carried out under the scheme, plan or policy;	
(ii) how the scheme provides for the prevention, minimisation and management of any relevant impacts;	
(b) a description of any approval that has been obtained from a State, Territory or Commonwealth agency or authority (other than an approval under the Act), including any conditions that apply to the action;	
(c) a statement identifying any additional approval that is required;	
(d) a description of the monitoring, enforcement and review procedures that apply, or are proposed to apply, to the action.	

6. Environmental record of person proposing to take the action

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

*** "***Johnson Property Group have demonstrated through all their developments that they are a responsible environmental manager. We have a history of incorporating environmental initiatives into all of our projects. Johnson Property Group have a number of large development sites in NSW and have taken a proactive approach to environmental management of all of our sites. More specifically (in relation to our Trinity Point Marina and Mixed Use Development) we will actively manage the surrounding environment and have already established an environmental testing*

regime that will permit long term monitoring of water quality impacts of the marina proposal.

In relation to our Cooranbong development, we have negotiated with Hunter Water Corporation about supplying this development with non-potable water supply. The infrastructure required to pump non-potable water to the site is in the vicinity of $12 million which we are committed to providing.

At the request of our ecologists, we secured additional land at the Cooranbong site (known as Masons land) that in large part will be set aside in perpetuity for Conservation purposes. This land provides a good north-south link through to the adjoining Olney State Forest."

7. Information sources

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

(a) the source of the information; and	Primary information was collected by recognised ecologists and described in *Appendix B, B(i), B(ii) B(iii) & C*
(b) how recent the information is; and	Collected between 2004 & 2008
(c) how the reliability of the information was tested; and	The reliability of the information was tested through the internal review processes of respective consultants.
(d) what uncertainties (if any) are in the information.	No uncertainties current surround the collected information

8. Consultation

(a) Any consultation about the action, including:	*(Section 1.4 of this report)*
(i) any consultation that has already taken place;	
(ii) proposed consultation about relevant impacts of the action;	
(iii) if there has been consultation about the proposed action — any documented response to, or result of, the consultation.	
(b) Identification of affected parties, including a statement mentioning any communities that may be affected and describing their views.	

Specific EPBC Act Matters

Vegetation surveys and mapping

Development Site

(Refer Appendix F)

Offset areas

Information relating to recorded locations of the three identified listed species may be found in Appendix F

Urban Design

Details of the proposed development footprint and landuses are shown on Figure 17 and are described in detail in Section 5.0 of this report. Plan detailing development footprints in relation to known threatened species locations are shown in *Appendix B(iii).*

Details of how the proposal minimises impacts on threatened species may be found in Sections 5.0 and 7.3 of this report.

Other Information to be provided

Total area to be conserved in the proposed onsite reserves

The total area of onsite reserves is 115.03ha or 31.46% of the site as shown on Figure 17 and in the Concept Plan document (*Appendix P).*

Details of land that has been/will be purchased to offset areas in the proposed development footprint

Ecological Details of land purchased a offset areas are contained in Section 2.6 of this report.

Additional areas to be purchased as offset are subject to DECC review, thus ensuring they of adequate ecological value.

Description of proposed linkages between onsite and offsite vegetation

Proposed linkages are illustrated in Figure 15 of this report, page 5 of the Concept Plan (Appendix P) and described in Section 7.3.

Proposed management of onsite and offsite reserves

Ongoing management of conservation reserves is detailed in section 5.8.4 of this report.

3.2 Strategic Framework

3.2.1 Lower Hunter Regional Strategy

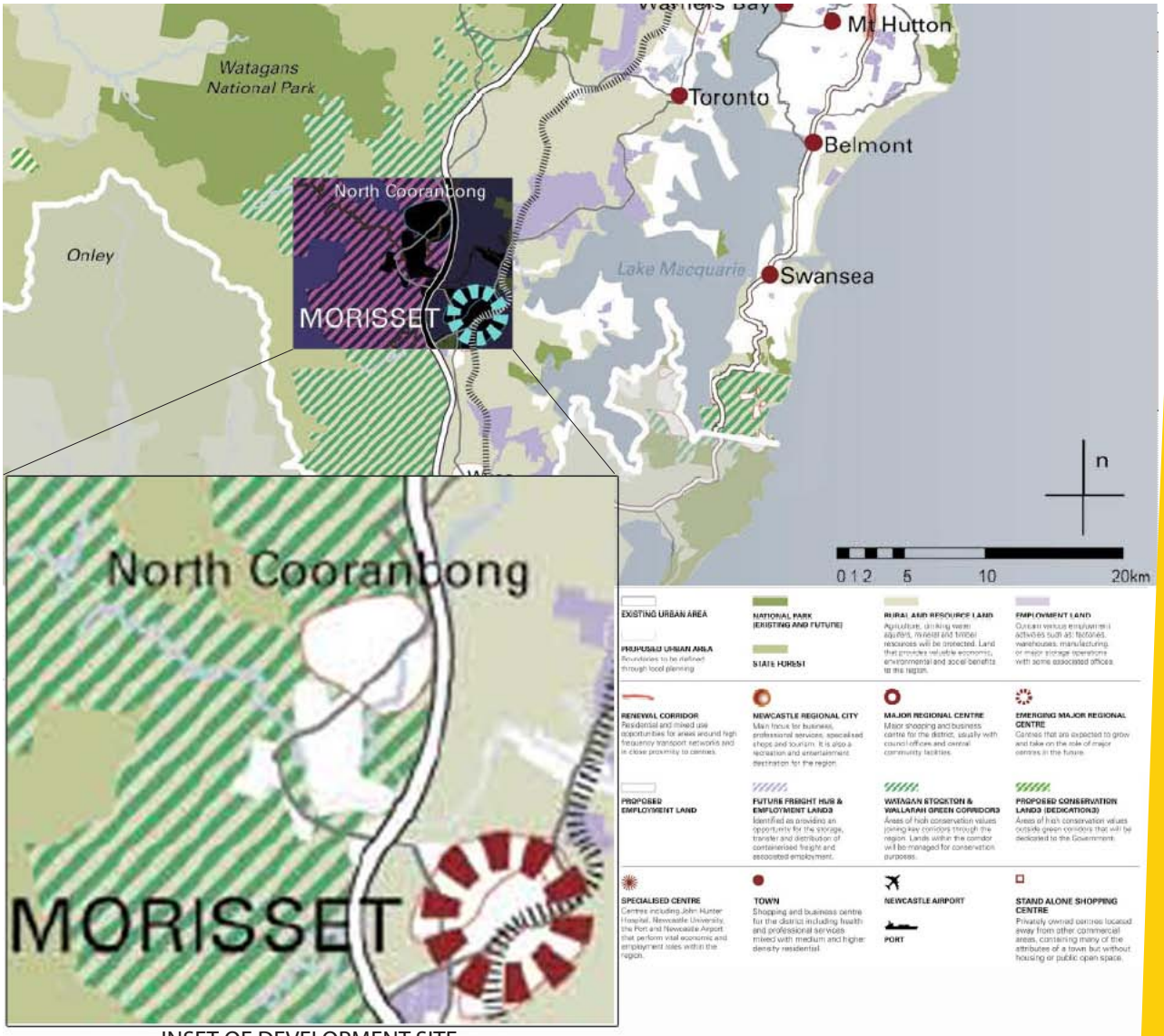
In October 2006 the NSW Department of Planning released the Lower Hunter Regional Strategy 2006 (LHRS). This strategy provides region wide direction to ensure the adequate provision of land for various uses over the next 25 years. This plan aims to sustainable provide for the predicted demand for residential and employment land over this period.

Residential capacity of the region forms a major component of the LHRS with provision for residential land to accommodate approximately 115,000 new dwelling houses for an estimated 160,000 increase in population.

Among future urban areas identified by the LHRS is the North Cooranbong area. Specifically the LHRS identifies the North Cooranbong future urban area as accommodating up to 3000 new dwellings. Due to the regional and state significance of this project, this proposal seeks the Minister's concept plan and rezoning approval to allow a new community to be developed catering for 2500 residential lots of varying size and associated supporting infrastructure. This represents approximately 2.2% of the proposed new residential lots/dwelling proposed under the strategy. This equates to approximately 3.9% of the anticipated population growth in the region. Importantly the site represents the major urban (residential) release in the West Lake Macquarie area with the ability to meet demand for residential land in the area highly dependent on the timely, efficient and sustainable release of this site.

The subject site is an important part of the LHRS and the proposal can therefore be seen as consistent with the regional objectives of this plan in ensuring there is sufficient residential land to accommodate expected growth.

Reference is made to ***Figure 12*** – Lower Hunter Regional Strategy



INSET OF DEVELOPMENT SITE

Source: © NSW Department of Planning

Not to Scale

LOWER HUNTER REGIONAL STRATEGY PLAN

FIGURE 12

3.2.2 Draft Lower Hunter Regional Conservation Plan

The Draft Lower Hunter Regional Conservation Plan (DLHRCP) was prepared in unison with the LHRS and outlines the conservation objectives for the region over the next 25 years. Having been identified as future residential land in the LHRS, the subject site is not identified for conservation under this plan and therefore the proposal is not contrary to the Plan. Furthermore site specific environmental objectives have been designed into the concept plan to ensure waterways and 'green corridors' link to off site vegetation which further connects to conservation areas identified under this plan, reinforcing its objectives.

Negotiations are currently underway with the DECC and DoP to maximise development of the site in line with the density targets set by the LHRS. This will occur with the aim of preventing the underutilisation of land identified in the strategy therefore preventing deficiencies in residential land in the future. Enabling the LHRS targets to be met for the subject site will prevent pressure of additional environmentally constrained land. Therefore in order to achieve the desired development density on the site the DECC will nominate environmental offset land for purchase/maintenance. This will be fully covered in the regional voluntary planning agreement.

3.2.3 Lake Macquarie City Council – Lifestyle 2020

The *Lake Macquarie Lifestyle 2020 Strategy* (Lifestyle 2020) was adopted by Council on 27 March 2000, to underpin the land use provisions of LEP 2004 and DCP's 1 and 2. Lifestyle 2020 provides broad strategies to manage population and employment growth expected to occur in Lake Macquarie over the next 20 years. The strategy acknowledges that land use planning, environmental management and socio-economic development are intrinsically interrelated. The strategy states:
"The vision for the City, held by Council and the community, is that it is:

- *A place where the environment is protected and enhanced.*
- *A place where the scenic, ecological, recreation and commercial values and opportunities of the Lake and coastline are promoted and protected.*
- *A place that recognises encourages and develops its diverse cultural life and talents and protects and promotes its heritage.*
- *A place that encourages community spirit, promotes a fulfilling lifestyle, enhances health and social well being, encourages lifestyle choices and has opportunities to encourage participation in sport and recreation.*
- *A place that promotes equal access to all services and facilities and enables all citizens to contribute to and participate in the City's economic and social development.*

In terms of managing population growth, Lifestyle 2020 states that not only will there need to be new homes for natural population growth, but also new homes to compensate for existing households becoming smaller. To address this, the LEP

2004 identifies land that is considered strategically suitable for future urban and conservation purposes by application of the 'Investigation' land use zone. The onus is then upon the landowner to confirm, via site-specific environmental assessment, that the site is also capable of sustaining the urban use intended.

The subject site has been identified as strategically suitable for development. The environmental assessment carried out as part of this submission, and as part of the previous Council process, demonstrates that the site is capable of sustaining development in the manner proposed.

The following 'core values' under Lifestyle 2020 demonstrate the proposal is consistent with the adopted strategy.

- *Sustainability* – By developing an area which adjoins existing urban areas the proposal seeks to optimise the use of existing infrastructure, services, retail facilities and employment opportunities.
- *Equity* – The proposal seeks to provide housing choice in a well resourced attractive area.
- *Efficiency* – Residential development on the site would help to provide sufficient critical mass to justify upgrading of existing infrastructure.
- *Liveability* – The proposal seeks to ensure that development on the site will reflect the history and ecology of the site and create a safe attractive well designed community.

Development in accordance with the 'core values' ensures that future development in the City is consistently managed, and promotes a sustainable and shared vision for the City.

The goals and objectives associated with each of the 'core values' that are particularly relevant to this proposal include:

- to provide urban communities with a good balance and range of housing – the proposal will provide a range of development types and increase housing choice in the region. Housing affordability is a must.
- encourage a mixture of housing types to serve a range of income levels – the proposal will provide for a mix of housing types and land sizes on the site, based on the hierarchy of centers principle (i.e. higher density surrounding the hub area, radiating out to larger residential lots along the periphery).
- to use land efficiently – the proposal identifies land which can be developed and ensures that land is developed effectively.
- to minimise clearance of bushland – the proposal limits the clearance of bushland with large areas retained along riparian corridors and adjoining areas of surrounding bushland. Bushlandd cleared will be offset as agreed with DECC and DoP.

- maintain the highest and best use of land – the proposal provides an efficient use of land outside the flood plain and close to facilities and services.

Implications for the proposal
Future development applications must be generally consistent with LEP 2004, DCP 1 and DCP 2, and North Cooranbong Concept Plan as proposed by this submission.

3.3 Statutory Framework

The following section provides a summary of relevant State, Regional and Local Environmental Planning Instruments (EPI's) that are applicable to the subject site

3.3.1 Major Project SEPP

The Minister for Planning is the approval authority in respect to Part 3A of the Major Project SEPP. This SEPP lists categories of development that, with Minister's consent, are subject to assessment and determination under Part 3A of the EP & A Act.

On the 19th October 2007 the DoP confirmed that the proposal was a development to which Part 3A of the EPA Act 1979 applies. The Minister, in a letter dated 8th November 2007 (***Appendix E***) advised that he agreed to consider the above site as a potential state significant site under the provisions of State Environmental Planning Policy (Major Projects 2005) and further authorise the submission of a concept plan for the site.

The Minister advised that in considering whether to include the site in Schedule 3 or 4 he required the preparation of a study pursuant to Clause 8 of the Major Project's SEPP.

Schedule 3 of the Major Project's SEPP affectively rezones the site and determines appropriate development control to guide future development of the site. Schedule 4 allows an existing environmental instrument, in this case the Lake Macquarie LEP 2004, to be amended in line with the proposal. A State Significant Site Study seeking the Minister to decide whether the North Cooranbong site is a state significant site is attached ***Appendix F***.

3.3.2 SEPP 11

Developments with certain characteristics can be classified as Traffic Generating Developments under this EPI and as such require referral to the relevant Traffic Authority for assessment as part of the 3A Major Projects Assessment process.

The relevant traffic authority for the proposal is the Roads and Traffic Authority (RTA). The RTA have been consulted over 3 years on this project and referral to the RTA will again occur under the Part 3A assessment. Traffic management studies and the traffic implications of the development are fully discussed in **Section 7** of this report.

3.3.3 SEPP 55

SEPP 55 aims to promote the rehabilitation of contaminated lands so they can be further utilised without the threat of health risks to the population or the environment. Consideration of this SEPP is required during the assessment of applications on contaminated lands. As the subject site contains a number of contamination issues (however small), consideration of this SEPP is required.

Section 7 of this document provides a discussion of the preliminary contamination assessment undertaken as part of the environmental assessment for this concept application.

In summary it was shown that the site contained a number of minor contamination issues which can be ameliorated as part of site preparation to safely permit future development as shown in the concept plan.

Please note that the proponent has received Development Application and Construction Certificate Approval from Lake Macquarie Council to remediate a biosolids storage area on the subject site. Council's reference numbers are DA 175/2007 and SCC 90/2007.

3.3.4 Draft SEPP 66

This draft SEPP aims to better integrate land use and transport planning at the local level, by putting in place provisions to guide:

- the preparation of draft local environmental plans
- the adoption of development control plans and master plans
- the consideration of development applications.

In relation to new residential development, the draft SEPP 66 states:

(1) In preparing an environmental planning instrument that will allow residential development on land that is not being used for residential purposes, and before approving a development control plan, master plan or precinct plan relating to such a plan, the person who prepares or approves the instrument or plan should include provisions that:

(a) ensure an average gross residential density of development within the neighbourhood of at least 15 dwellings per hectare, and support the achievement of viable public transport thresholds, and

(b) that development of the land will result in building forms and subdivision designs and layouts that encourage and are supportive of walking, cycling and the use of public transport.

(2) Despite subclause (1), the Minister may make a local environmental plan, with provisions that will allow an average gross residential density of development, within the neighbourhood of less than 15 dwellings per hectare, if the council for the area concerned can justify a lower density by reasons that specifically address any departure

(3) From the planning objectives of this Policy.

In relation to the concept proposal the following points need to be considered:

- It is desirable that any proposed residential development endeavour to achieve the state government's target minimum density of 12 dwellings per hectare for new residential release areas in the lower Hunter.
- The concept plan is accompanied by a traffic and transport report which assesses the impact of the proposed uses on the surrounding street network and includes recommendations for new roads and new public transport routes.
- To encourage use of alternative modes of transport to the car, building forms and subdivision designs and layouts should encourage walking, cycling and the use of public transport, and bus services should be introduced early in the development process. The Concept Plan is conducive to these objectives. A TMAP has also been prepared to address alternative forms of transport ***(AppendixR)***
- There will be consultation with transport operators (i.e. Toronto and Morisset Bus Companies) as a precursor to the initial development applications for subdivision. A subsidy to Ministry of Transport for the provision of bus services is likely to form part of a regional planning agreement for this development.

Draft SEPP 66 has been taken into consideration during the preparation of the Concept Plan and expanded further in the document.

3.3.5 HREP 1989

The aims of this plan are:

(a) to promote the balanced development of the region, the improvement of its urban and rural environments and the orderly and economic development and optimum use of its land and other resources, consistent with conservation of natural and man made features and so as to meet the needs and aspirations of the community,

(b) to co-ordinate activities related to development in the region so there is optimum social and economic benefit to the community, and

(c) to continue a regional planning process that will serve as a framework for identifying priorities for further investigations to be carried out by the Department and other agencies.

In relation to the provision of housing, Division 1 of the HREP 1989 has the following aims:
The objectives of this plan in relation to planning strategies concerning housing are:

(a) to provide opportunities for adequate provision of secure, appropriate and affordable housing in a variety of types and tenures for all income groups throughout the region, and

(b) to ensure that the design and siting of residential development meets community needs, minimises impact on the natural environment and involves the quality of the region's built environment.

While the aims and objectives of the HREP 1989 deal primarily with the creation of Local Planning Instruments, the proposed concept can be considered to promote the aims and objectives of the plan through the provision of sustainable and serviced residential land to accommodate the future growth of the region, in line with the Lower hunter Regional Strategy.

3.3.6 HREP (Heritage) 1989

The general aims and objectives of this plan are:

(a) to conserve the environmental heritage (including the historic, scientific, cultural, social, archaeological, architectural, natural and aesthetic heritage) of the Hunter Region,

(b) to promote the appreciation and understanding of the Hunter Region's distinctive variety of cultural heritage items and areas including significant buildings, structures, works, relics, towns, precincts and landscapes, and

(c) to encourage the conservation of the Region's historic townscapes which contain one or more buildings or places of heritage significance or which have a character and appearance that is desirable to conserve.

No items on the subject site have been identified as being listed in this instrument therefore it is not considered to apply to the proposal. Due diligence has been undertaken to ensure items of heritage significance have been accommodated in the concept design. While a number of items of local heritage significance (as listed in the Lake Macquarie LEP 2004) have been identified onsite, no regionally listed items have been identified.

3.3.7 Existing Land Use Zonings

The objective of the Lake Macquarie LEP 2004 is to achieve development of land to which this plan applies that is in accordance with the principles of ecologically sustainable development by:

(a) Promoting balanced development of that land, and

(b) Implementing the Lifestyle 2020 Strategy adopted by the Council on 27 March 2000.

The following existing zones appy to the subject site, as detailed in the Lake Macquarie LEP 2004. (Refer ***Figure 13***)

Table 7 –Existing zonings within subject site boundary. *Source: Lake Macquarie LEP Maps 2004*

Zone 1 (1) Rural (Production) Zone	**1 Objectives of zone** (a) provide for economic and employment-generating agricultural activities, and (b) provide for a range of compatible land uses that maintain and enhance the rural environment of the locality, and (c) ensure development is carried out in a manner that improves the quality of the environment, including quality of design, and is within the servicing capacity of the locality, and (d) encourage development and management practices that are sustainable, and (e) encourage the development of good quality agricultural land for agriculture (other than intensive agriculture) to the greatest extent possible, and (f) encourage the development of low quality agricultural land for intensive agriculture, and (g) provide for sustainable forestry practices, and (h) avoid land use conflict by restricting or prohibiting development that has the potential to negatively affect the sustainability of existing agriculture, and (i) provide for sustainable water cycle management.
Zone 2 (1) Residential Zone	**1 Objectives of zone** (a) permit development of neighbourhoods of low-density housing, and (b) provide for general stores, community service activities or development that includes home businesses whilst

	maintaining and enhancing the residential amenity of the surrounding area, and (c) ensure that housing development respects the character of surrounding development and is of good quality design, and (d) provide for sustainable water cycle management.
Zone 7 (2) Conservation (Secondary) Zone	**1 Objectives of zone** (a) protect, conserve and enhance land that is environmentally important, and (b) protect, manage and enhance corridors to facilitate species movement, dispersal and interchange of genetic material, and (c) enable development where it can be demonstrated that the development will not compromise the ecological, hydrological, scenic or scientific attributes of the land or adjacent land in Zone 7 (1), and (d) ensure that development proposals result in rehabilitation and conservation of environmentally important land, and (e) provide for sustainable water cycle management.
Zone 10 Investigation Zone	**1 Objectives of zone** (a) provide land for future development and/or conservation, and (b) ensure that land in this zone is thoroughly assessed to identify and substantiate future uses, and (c) provide for limited development of the land and allow that development only where it can be proven not to prejudice or have the potential to prejudice future protection or use of the land, and (d) ensure that land is released in a strategic and efficient manner consistent with the *Lifestyle 2020 Strategy*, and (e) require comprehensive local environmental studies to substantiate the capability and suitability of land in this zone proposed for rezoning, and (f) provide for sustainable water cycle management.

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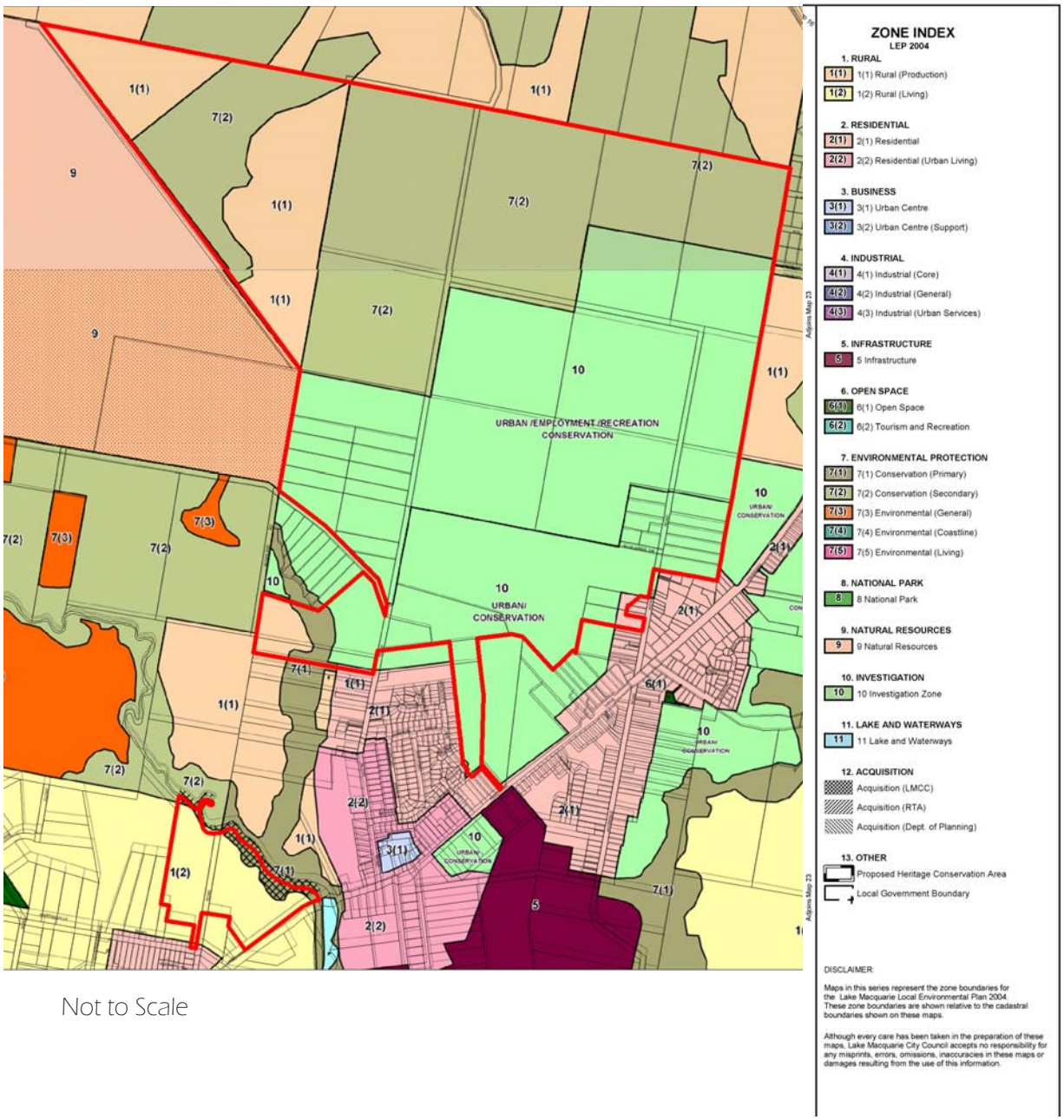

Not to Scale

EXISTING LEP ZONING MAP

FIGURE 13

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3.3.8 Section 117 Directions

The section 117 Ministerial Directions listed in the following table are of key relevance to the proposed development. Relevant Section 117 Directions include:

- Direction No. 9 – Conservation and Management of Environmental and Indigenous Heritage;
- Direction No. 10 – Designated Development;
- Direction No. 11 – Development in a Mine Subsidence District or on Unstable Land;
- Direction No. 13 – Environmental Protection Zones;
- Direction No. 15 – Flood Prone Land;
- Direction No. 17 – Integrated Land Use and Transport;
- Direction No. 19 – Planning for Bushfire Protection;
- Direction No. 21 – Residential Zones;
- Direction No. 22 – Rural Zones; and
- Direction No. 25 – Site Specific Zoning.

Consideration of the relevant provisions within these Directions is provided in ***Appendix G***.

3.4 Integrated Development

Section 75U of the EPA Act 1979 relates to the application of additional NSW legislation to projects which are being assessed under Part 3A of the Act. Specifically, projects being assessed under Part 3A are not subject to the same integrated development assessment as projects being assessed under Part 4 of the Act, however consultation with the same government departments can occur to obtain comments in relation to the Part 3A concept proposal.

The following therefore provides a preliminary assessment of the concept plan in relation to integrated development to demonstrate how integrated development considerations have been incorporated into the concept plan and how government departments' concerns have been anticipated and addressed as part of the concept plan.

Table 8 below outlines where integrated development approvals would otherwise be required under integrated development (Part 4 assessments) and how any resulting issues have been addressed in the concept plan.

Table 8 – Consideration of Integrated Development Legislation

Act and Section	Comment
Fisheries Management Act 1994	
s 144 aquaculture permit	No aquaculture permit has been or will be sought therefore this does not apply
s 201 permit to carry out dredging or reclamation work	No dredging or reclamation work is proposed therefore this does not apply
s 205 permit to cut, remove, damage or destroy marine vegetation on public water land or an aquaculture lease, or on the foreshore of any such land or lease	No marine vegetation will be damaged or destroyed under the concept plan therefore no permits would be sought or required.
s 219 permit to: (a) set a net, netting or other material, or (b) construct or alter a dam, floodgate, causeway or weir, or (c) otherwise create an obstruction, across or within a bay, inlet, river or creek, or across or around a flat	No permits to collect under this section are required therefore this does not apply.
Heritage Act 1977	
s 58 approval in respect of the doing or carrying out of an act, matter or thing referred to in s 57 (1)	No items as listed on the State Heritage Register were found on the site. Despite this an assessment of the heritage features of the site was undertaken as part of the background studies to the site.
Mine Subsidence Compensation Act 1961	
s 15 approval to alter or erect improvements within a mine subsidence district or to subdivide land therein	Correspondence has been received from the mine subsidence board indicating that part of the subject site is located within a proclaimed mine subsidence district. This is addressed in Section 7.5.3.
Mining Act 1992	
ss 63, 64 grant of mining lease	No mining lease is being sought or has been sought for the subject site by the proponent or any known third party.
National Parks and Wildlife Act 1974	
s 90	An assessment of the Indigenous

consent to knowingly destroy, deface or damage or knowingly cause or permit the destruction or defacement of or damage to, a relic or Aboriginal place	heritage of the site has been undertaken. It was concluded that there was no known items or relics on the site proposed to be disturbed in the concept plan. However, due diligence should be undertaken during site preparation if any relics are located. Appropriate authorities and the Local Aboriginal Land Council would be informed if such a find occurred.
Petroleum (Onshore) Act 1991	
s 9 grant of production lease	NA
Protection of the Environment Operations Act 1997	
ss 43 (a), 47 and 55 Environment protection licence to authorise carrying out of scheduled development work at any premises.	NA
ss 43 (b), 48 and 55 Environment protection licence to authorise carrying out of scheduled activities at any premises (excluding any activity described as a "waste activity" but including any activity described as a "waste facility")	NA
ss 43 (d), 55 and 122 Environment protection licences to control carrying out of non-scheduled activities for the purposes of regulating water pollution resulting from the activity.	NA
Roads Act 1993	
s 138 consent to: (a) erect a structure or carry out a work in, on or over a public road, or (b) dig up or disturb the surface of a public road, or (c) remove or interfere with a structure, work or tree on a public road, or	The concept plan identifies a number of road improvements which will be required to accommodate the increased traffic created by the increase in population. Connection of roads has taken into consideration the design requirements of the RTA Council. Continuing communications will be entered into with the RTA as is required in respect to upgrading works proposed on roads under the control of

(d) pump water into a public road from any land adjoining the road, or (e) connect a road (whether public or private) to a classified road	RTA.
Rural Fires Act 1997	
s 100B authorisation under section 100B in respect of bush fire safety of subdivision of land that could lawfully be used for residential or rural residential purposes or development of land for special fire protection purposes	A bushfire threat assessment has been prepare for the site which determined appropriate setbacks required to provide an adequate level of bushfire protection as required by the RFS's document *Planning for Bushfire Protection 2006.* These buffer areas have been built into the concept design to ensure an adequate level of bushfire protection can be achieved.
Water Management Act 2000	
ss 89, 90, 91 water use approval, water management work approval or activity approval under Part 3 of Chapter 3	N/A

Again it is noted that integrated development does not apply to concept applications under Part 3A of the Act, however consultation with the respective agencies who enforce the above Acts may take place as part of the 3A assessment process. As outlined above the general consideration of these issues has taken place as part of the concept plan design process and no outstanding issues have been identified. We understand that future applications for subdivision under Part 4 will not need to be referred to integrated approval bodies as the matters have been addressed under this Part 3A application.

4.0 STATE SIGNIFICANCE OF THE SITE

Under the Major Projects SEPP, specific projects can be classified as being State Significant Sites (SSS) where they are viewed as having characteristics which represent a considerable asset or project for the State of NSW. The ability to classify sites as State Significant allows the NSW State Government to accomplish development outcomes which are of state importance.

The subject site was identified as being an area of significant future residential growth under the Lower Hunter Regional Strategy with a target of up to 3000 lots being set on the site. After significant baseline studies were undertaken on the site to support its rezoning (under a previous zoning scheme prior to the release of the LHRS) it was evident that the site would have the capacity to accommodate much, but not all, of the anticipated residential growth for which it was identified in the Lower Hunter Regional Strategy.

Correspondence from the Department of Planning dated 8th November 2007 (***Appendix E***), to the proponent indicated that the Minister has formed the opinion that the subject site is a site to which the Major Projects SEPP may apply. In forming the opinion as to whether the site would be classified as State Significant the Minister requested an analysis to be undertaken to provide information on a draft concept plan for the site which would be then used to determine whether the site would be included in Schedule 3 or Schedule 4 of the Major Projects SEPP. Correspondence between the DoP and the proponent is included in ***Appendix F.***

This EAR and concept plan as a whole supports the classification of this site as a State Significant Site (SSS) and constitutes an Environmental Assessment Report for the North Cooranbong site. It has been prepared to fulfill the Director General's Requirements and support the listing of the subject site as State Significant. These requirements for assessment under Clause 8(2) of SEPP (Major Projects) 2005, include:

(a) The State or regional planning significance of the site, and

(b) The suitability of the site for any proposed land use taking into consideration environmental, social and economic factors, the principles of ecological sustainable development and any State or Regional planning strategy, and

(c) The implications of any proposed land use for local or regional land use, infrastructure, service delivery and natural resource planning, and

(d) Any other matters required by the Director-General.

A separate report, The State Significant Site Study, outlining the State Significance of the site is included in ***Appendix F***. The Director General's

Requirements are also addressed in a condensed form in this separate report included in ***Appendix F***.

This EAR and State Significant Site Study, in concert, address these Clause 8(2) requirements.

5.0 CONCEPT PLAN

5.1 Background

The North Cooranbong project covers an area of some 365ha located within the Local Government Area of Lake Macquarie, approximately 100km north of Sydney.

It sits adjacent to the existing township of Cooranbong adjoined by state forest and rural residential properties. Part of the area includes the existing Avondale School.

Part of the land was first identified by Council as an investigation area for future urban conservation, employment and recreational purposes, subject to the findings of an environmental assessment.

JPG first became involved in the site in the year 2000 and after years of environmental analysis and urban design analysis, JPG (who by then controlled approximately 96% of the site) submitted a rezoning application to LMCC in March 2005.

In July 2005 Lake Macquarie City Council resolved to commence the rezoning process and subsequently forward Section 54(4) advice to DoP for approval. In granting their approval to commence the rezoning process, DoP ordered an independent Local Environmental Study be prepared. LMCC appointed URS Environmental Consultants to prepare the required LES, which was ultimately finalised in December 2006. Council and DoP subsequently agreed to place this LES and supporting draft LEP on exhibition for 3 months between May and August 2007.

As a result of the NSW Government releasing the final Lower Hunter Regional Strategy and draft Regional Conservation Plan, (and as these important strategic planning documents were not properly considered during the independent LES process), the proponent commenced further discussions with the relevant Government bodies which lead to a need to review the previous planning scheme. The proponent lodged a Preliminary Assessment Report to the Department of Planning in September 2007 asking that this project be considered a Major Project pursuant to Part 3A of the EP&A Act. On the 19th October 2007 the Minister formed the opinion that the proposal is a development to which Part 3A applies. Then on the 8th of November 2007, the Minister indicated that the site could be potentially a State Significant Site.

A revised concept plan has been prepared for the site in reference to past studies, the implementation of the Lower Hunter Regional Strategy (and its supporting Regional Conservation Plan document) and outcomes of negotiations with Government bodies.

This concept plan examines the considerations and findings of those studies to develop a maximum site responsive design. It should therefore be read together with the study document which examines the issues in more depth. The concept plan draws on these conclusions and responds to the site's natural features.

5.2 Introduction

HDB Town Planning and Design has been engaged to review the previous studies and urban design work carried out on the site by Architectus, JW Planning Pty Ltd URS Environmental Consultants and LMCC, together with other specialised base studies; and from that, develop a new, site-responsive concept plan.

The plan provides for up to 2,500 lots and supporting infrastructure on an area of 365ha. Refer ***Figure 14*** – Concept Plan

The concept plan outlines development objectives for the site and proposes a layout which underpins future zoning controls on the site. It interacts with the existing developments on the site, particularly the Avondale School and surrounding rural residential development, to provide a permeable, liveable and environmentally responsive residential environment. This is further examined as follows.

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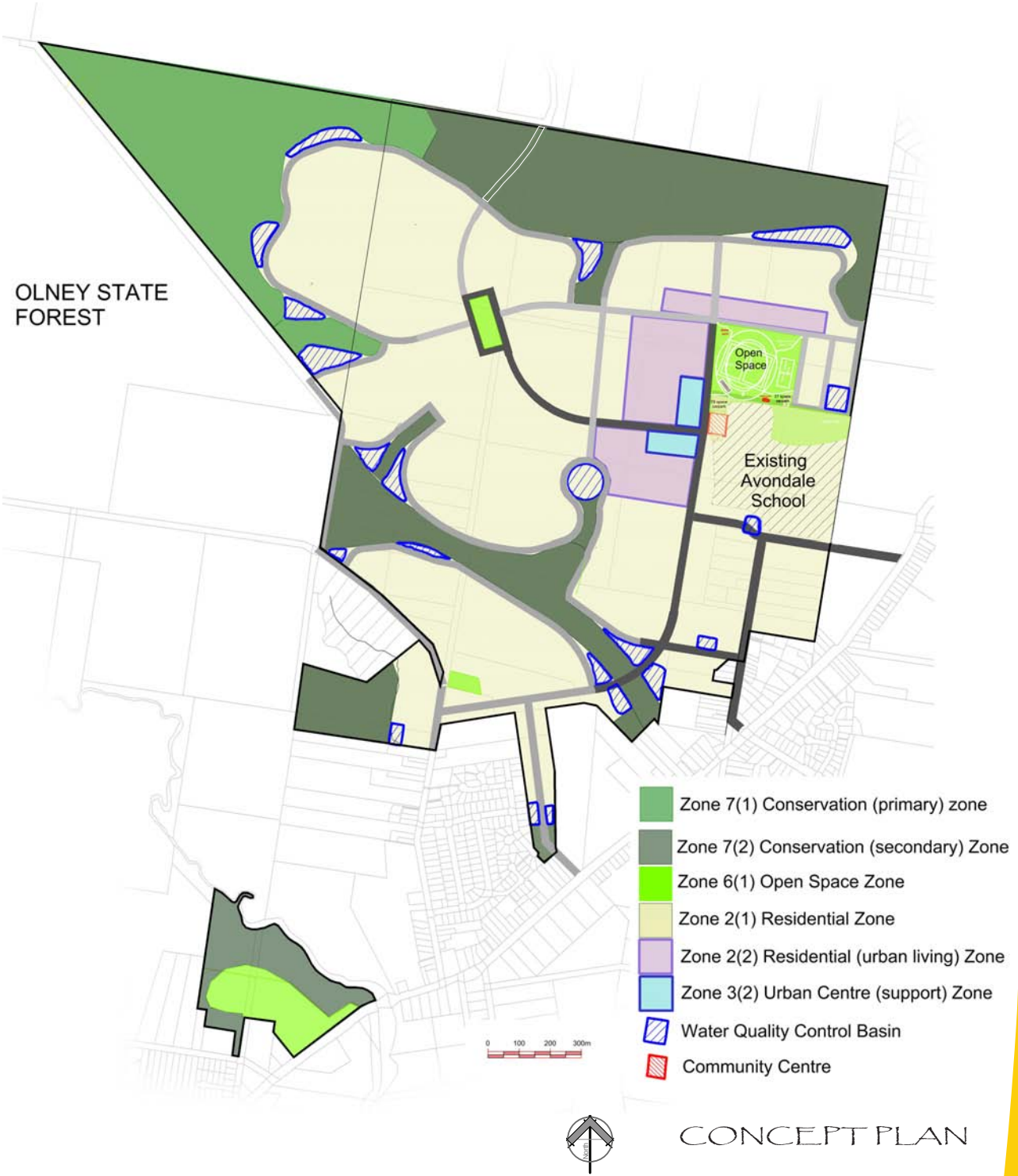

CONCEPT PLAN

FIGURE 14

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5.3 Ownership Details

Table 9 – Site Ownership details

Lot	DP	Ownership/Proponent	Area
1	595941	Australasian Conference Association Ltd (trustee for the Seventh-day Adventist Church)/Avondale Greens Developments P/L	5.895
11	129156	*As Above*	8.12
12	129157	*As Above*	3.62
20	129159	*As Above*	15.3
1 - 13	7352	*As Above*	17.8
1	3353	*As Above*	28.42
2	3353	*As Above*	27.41
3	3353	*As Above*	20.53
4	3353	*As Above*	19.54
5	3353	*As Above*	8.57
6	3353	*As Above*	18.14
7	3353	*As Above*	18.34
8	3353	*As Above*	19.65
10	3353	*As above*	18.34
1	825266	H. Pocock/Avondale Greens Developments P/L	27.03
1	170378	A. & P. Jacksons/ Avondale Greens Developments P/L	10.77
2	825266	M.Dabson/ Avondale Greens Developments P/L	5.051
Pt15	182756	I. & L. Mears/ Avondale Greens Developments P/L	1.383
1	348173	Avondale Greens Pty Ltd.	0.81
21	865588	Avondale Greens Pty Ltd.	3.568
Adjoining Land subject to JPG receiving landowner's consent			
1	329367	S. & P. Dodson	0.75
14	129157	J. & I. Dabson and M. & A. Dabson	0.8
1	301305	P. & R. Hitchcock	0.5
B	306673	F. Bryen	0.5
A	306673	D. Sheedy	0.5
13	129157	I. & C. Iselin	1.52
1	346776	L. & D. Volkl	0.43
2	346776	G. Ferguson	0.43
21	129159	D. & M. Batey	0.55
1	360725	J. Vosper	0.15
1	363639	A. & D. Roy	0.35
22	129159	K. Dixon	0.35
3	1029952	I. & G. Wheatley	1
2	663728	A. Doncevic	1.2
219	755218	J. & J. Mason and J. Mason & R. Cawthorne	58.3
Total Area (ha)			**365.00**

Refer **Plan 3** – Land Ownership Plan

5.4 Design Objectives and Land Use Principles

5.4.1 Vision

The vision and development philosophy for the site is addressed by the five key objectives below. These objectives have been based on the Lake Macquarie Lifestyle 2020 strategy in order to direct future detailed design and development of the site and will be implemented on site through draft Lake Macquarie Development Control Plan No. XX North Cooranbong (refer ***Appendix S***).

1 Respond to the environment

- Development should retain ecological corridors along main riparian corridors.
- Ecological corridors should link into the surrounding conservation areas.
- The pattern of development should respond to the natural topography.
- Contaminated land should be remediated if it is unsuitable for a proposed use before the land is developed.
- Development should encourage sustainable development principles.

2 Provide a diverse and well serviced community

- Development should create a legible, diverse community with a variety of house types.
- Development should provide a permeable road structure within the site which links the different residential areas and connects these areas with retained bushland, open space and community facilities.
- Development should balance residential land with appropriate provisions for local community and recreation facilities.
- Development should provide additional community facilities but avoid duplicating or weakening existing community facilities.

3 Provide a well designed, liveable neighbourhood

- Development should consider views from the surrounding area.
- The design of the neighbourhood should have a clear structure and a strong sense of place.
- Development should consider the urban form of the existing environment and build on the local character.
- Development should carefully consider features that could become local landmarks including high points, creek lines and where bridges cross the creeks.
- Stormwater detention should be located where it can become a positive feature of the landscape.
- Development should minimise risk from bushfires and flooding.

4 Encourage progress and prosperity

- Development should encourage home based businesses.

5 Create an integrated accessible development

- Development should define a compact and walkable neighbourhood with the majority of residents located within 5-10 minutes walking distance to a bus stop.
- Development should ensure that it can be approached from a variety of directions and is connected with existing roads, pedestrian routes and bicycles routes.
- Development should encourage walking/cycling to facilities within a reasonable distance including shops, schools and the Avondale School.
- Development should provide opportunities for future access connections through adjoining land.

5.5 Land Use

The urban design principles below have been based on the vision for the site and set out the goals and expectations for future development of the North Cooranbong site.

5.5.1 Sustainability

- Ensure areas of retained woodland do not become isolated from the surrounding area and remain viable communities.
- Ecological corridors have been determined in discussions with fauna and flora consultants and DECC and DoP, including consideration of biodiversity offsets.
- Retain major creeks and their tributaries were shown in the concept.
- Water sensitive urban design principles are to be applied at detailed design stage, for potable water demand and run-of water quality.
- Water quality measures could include a mix if bio detention swales and detention basins along roads and in areas of open space. These measures are to be located outside riparian and ecological corridors.
- Maximise the number of residential lots with a northerly aspect by designing roads to run east west where the topography allows for this alignment.
- Provision of non-potable water supply (3rd pipe).

Refer ***Figure 15*** – Sustainability Plan

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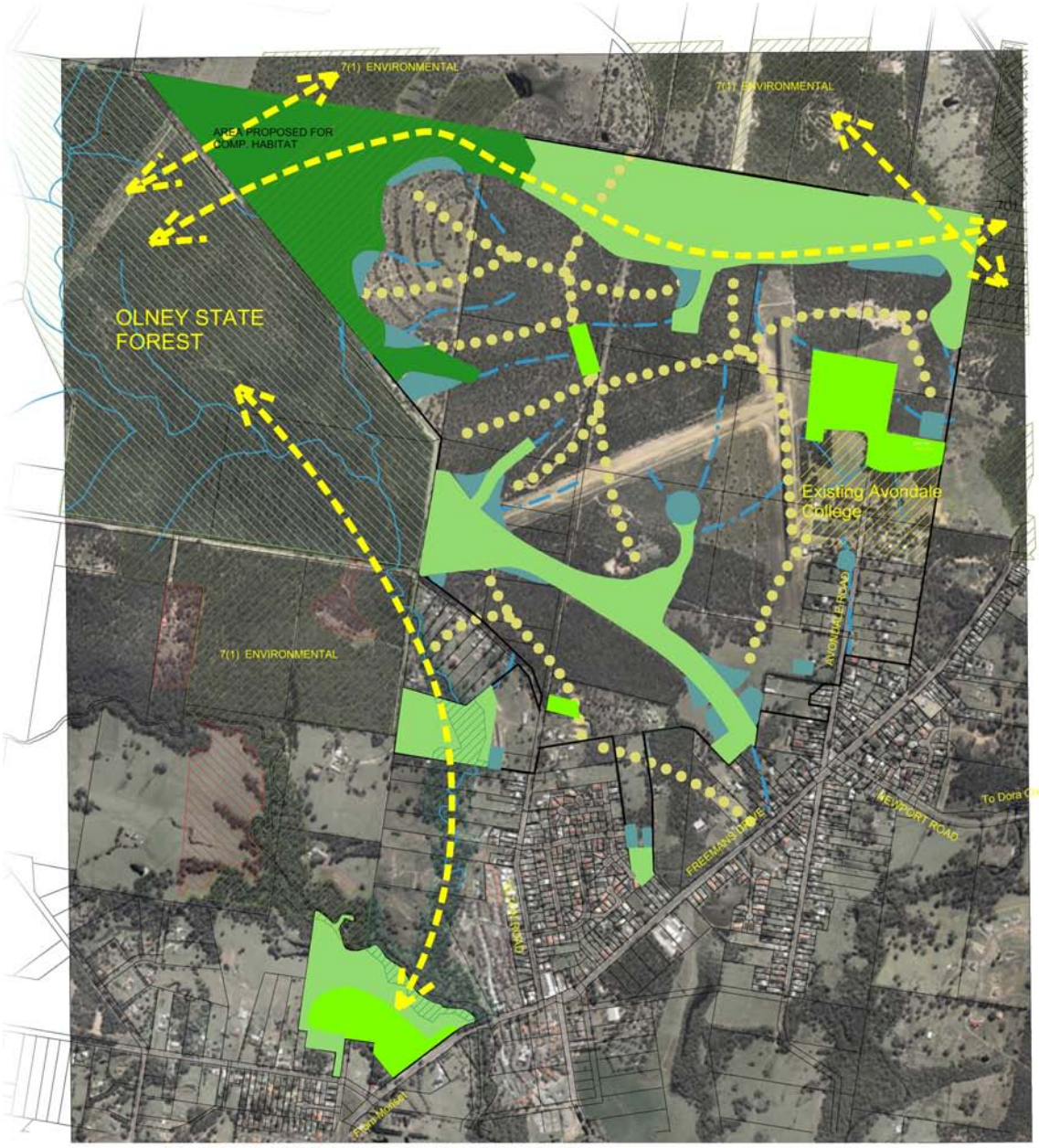

Not to Scale

- Zone 7(1) Conservation (primary) zone
- Zone 7(2) Conservation (secondary) Zone
- Zone 6(1) Open Space Zone
- Ridge Lines
- Linkages
- Water Quality Control Basin

0 100 200 300m

SUSTAINABILITY PLAN

FIGURE 15

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5.5.2 Built Form

- Provide a variety of residential types in the neighbourhoods to foster a diverse community, provide for wide marketability and respond to local character.
- Locate low density development on constrained sites and increase density of development where it can take the best advantage of local facilities, public transport and open space.
- Conventional housing
    - These areas would have an approximate density of between 10dw/ha and 12dw/ha. Large areas of the site will be conventional housing densities within precinct themes. Lots should be designed to maximise solar access and energy efficiency.
- Medium density
    - Areas of land facing open space, along collector roads and in close proximity to schools and community facilities will be available for well designed dual occupancy and small lot housing. Density tragets set at 20-25 dwellings/ha.

5.5.3 Landscape

- Provide ecological corridors of retained landscape which create a bushland setting for the development.
- The ecological corridors are to provide an appropriate environment for the protection of threatened species through habitat retention.
- Ecological corridors are to incorporate the main riparian corridors within the site.
- Whilst access through the ecological corridors and across riparian corridors will be restricted, provide for a range of passive recreation by the provision of bicycle paths and walkways next to the ecological corridors and riparian corridors.
- Prepare a landscape plan showing a footpath system through open space and retain landscape to local facilities.
- Reinforce road hierarchy with landscaping to define the main street.
- Provide quality landscape features in public open space areas to reinforce passive and active uses.
- Interconnect open space networks with environmental land.

5.5.4 Topography

- While the site has no areas of steep slope (>25 degrees) which are unsuitable for development, where there is steeper land locate dwelling forms that can be sensitively designed to respect the landform. (Refer ***Figure 6***)

- Roads are to follow contours to provide for easy walking and cycling to community facilities, open space or bushland where possible. Roads perpendicular to contours should be minimised.

5.5.5 Site Character

- Encourage the visual integration of new development with existing development in Cooranbong by locating proposed development around street entry locations where possible.
- Locate collector roads where possible to run beside or across areas of retained woodland, riparian corridors and open space to encourage local awareness of these areas and to visually integrate the bushland with the neighbourhoods.
- Reinforce the significance of the retained woodland, riparian corridors and open space by fronting significant development onto these areas.
- Design landscape features including drainage swales, open space, and street design to reflect the woodland character.

5.5.6 Views

- Views from surrounding area into the site are restricted as land generally rises away from perimeter roads, with limited views into the site. Where views into the site occur along Alton Road due to the land falling away from the road, provide lower density development adjoining the road to retain a woodland character.
- Align roads to capture views of the surrounding escarpment. Retain the north south runway alignment for the collector road as it terminates in a view of Mount Nellinda. East west roads on the western edge of the site will have views that terminate in the escarpment.
- Terminate roads with views of open space and bushland where possible. This will aid legibility by allowing visitors to orient themselves in the wider landscape and maximise the value of bushland views.

5.5.7 Employment

- Development should encourage home business. Encourage the design of dwellings that can accommodate home offices and home studios.
- Access to employment via road links and proximity to Morisset and Dora Creek rail stations and therefore easy access to employment locally and further a field.

5.5.8 Services and facilities

- The existing settlement of Cooranbong is well serviced by schools, local facilities and employment opportunities. The proposed development will reinforce the expansion of the existing Town Centre, local facilities, bus services and schools.

- Provide community facilities and improve the general amenities of the area.

5.5.9 Religion

- Cooranbong is an existing village with a strong Seventh-day Adventist community and Seventh-day Adventist services (ie Avondale School, Avondale College etc).

5.6 Access & Transport

- Integrate the proposed development with the Cooranbong area by providing high quality transport links to the existing road network and community facilities.
- Provide through site connections that improve the permeability of the wider Cooranbong area.
- Provide a minimum of two principal entries into the site. These access points will provide a route to the following areas of the site:
    - To the east of the site from Avondale Road
    - To the south west of the site from both sides of Alton Road
- Provide a link to the south of the site from the intersection of Avondale Road with Newport Road. If this link can not be provided directly across land outside the site boundary then provide a link through the site from Avondale Road. This link should be located as close as possible to the Newport Road and Avondale Road intersection.
- Allow for a link to the south of the site off Freeman Drive.
- Only designated roads in the structure plan may cross bushland.
- Identify existing bus routes which could be altered to travel through the site. The planning of land use and bus routes should provide catchments that allow 90% of users to be within 400m walking distance of a bus stop.
- Roads are to front areas of open space and retained landscape where possible. This will maximise views of the bushland, allow good access for fire protection, ensure that the open space and retained landscape is overlooked and reinforce the established character of new development.
- Provide a network of connections for both vehicular and pedestrian movement within the internal street layout. The layout creates a clear hierarchy of streets where collector streets are designed to appear of higher status than secondary streets.
- Roads are to generally follow land contours to provide comfortable walking and cycling connections between houses and open space and bushland.

Refer ***Figure 16*** – Transport Plan.

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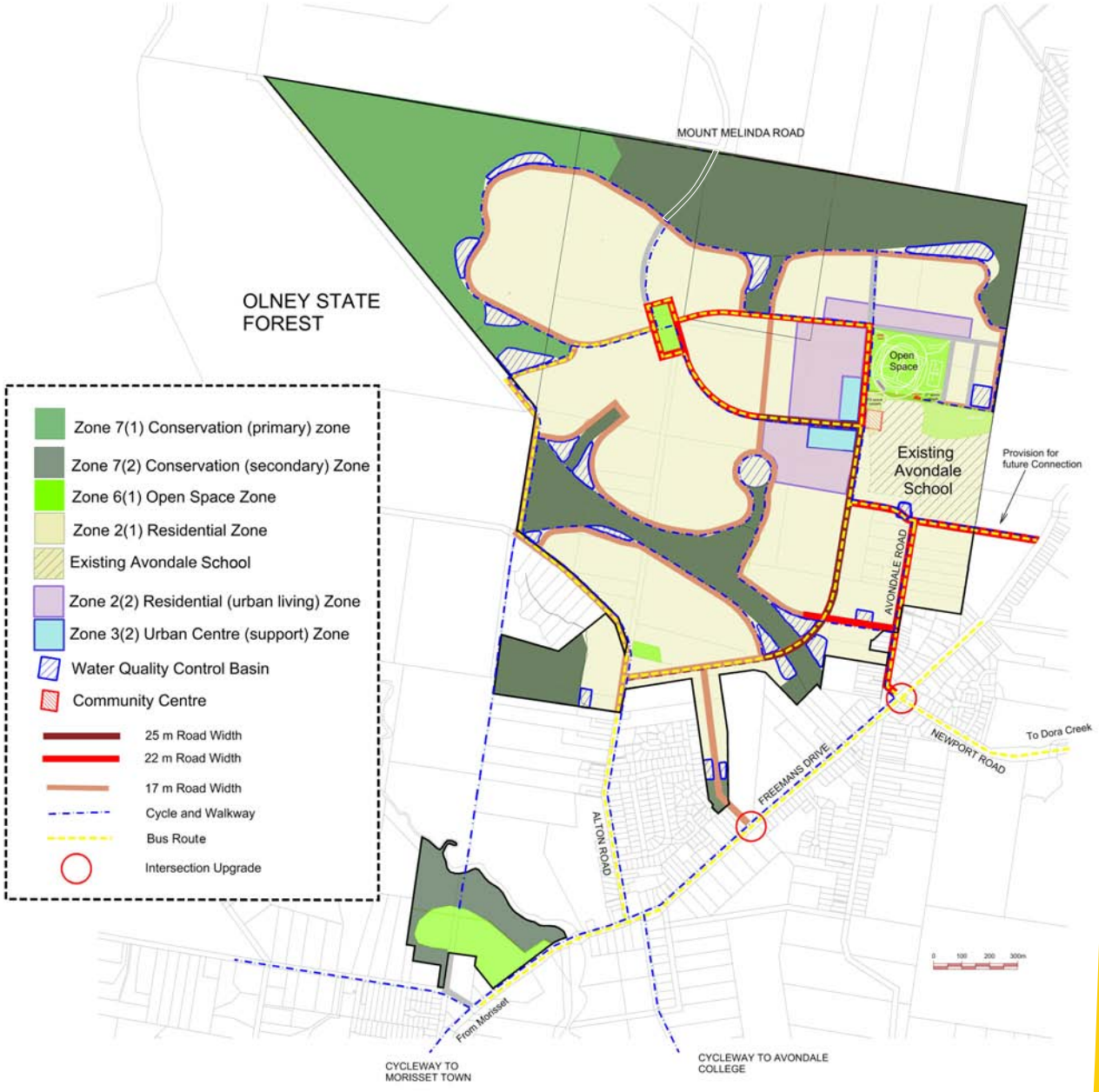

TRANSPORT PLAN

FIGURE 16

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5.7 Land Use Plan

Refer ***Figure 17*** – Land Use Plan.

Table 10 – Concept land uses

Land Use	Ha	% (approx. of 364.76Ha)
Environmental Conservation Area	106.35ha	29.1%
Open Space	10.8ha	3.0%
Residential (Urban Living)	18.83ha	5.12%
Urban Centre (Support)	2.15ha	0.6%
Water Quality Control Basins	10.4ha	2.85%
School Site (existing)	15.1ha	4.2%
Community Facilities	0.55ha	0.10%
Residential	186ha	51%
Sub Total	**350.186ha**	**95.97**
Town Common		
Environmental Conservation Public	8.68ha	2.38%
Recreation	6.0ha	1.65%
Sub Total	**14.78ha**	100%

5.8 Community Centre

5.8.1 School (private)

The needs of Avondale School has been accommodated in this Concept Plan. The school has been identified in the concept plan however it has not been subdivided from the larger site.

The proposed Structure Plan will have the following interaction with the school:

Character

The school currently is in a rural/bush setting with undeveloped land to the north, east and west of the site. To the south along Avondale Road, there's a more urban character, although the large blocks of land create a suburban edge or semi rural quality.

The Structure Plan would change the character of the school to become more integrated with an urban/suburban environment. The Structure Plan locates developable land to the north west and west of the school. The visual impact of urban development would be reduced from within the school due to the slope of the land which focuses views to the north of the site.

The location of the sporting fields adjoining to the north, maintains an open view and provides a synergy with the school.

Access

The school is located at the end of Avondale Road, along a cul-de-sac. There is only one access point into the school from this road. The one entry location creates a number of difficulties as all access to the school including buses and parent drop off/pick up area and staff movements occur at this one location and all vehicles are required to turn within the site.

The Structure Plan provides additional access routes into the school site, which would allow greater flexibility and allow future development of separate campuses with different access routes.

The network of roads within the structure plan will allow buses to drop off and pick up in a designated location. This will avoid the need to provide a bus turning bay within the school site and make land available within the school that is currently used for this purpose.

Bicycle routes to and through the site would also link to the school providing an alternate mode of transport for students and staff.

Frontage

As noted above the school currently has no long boundary along a public road. This reduces visibility of the school in the wider community and limits flexibility for access to the school. The Structure Plan establishes a new frontage for the school along the western boundary of the site.

Community facilities

A number of community facilities have been recommended as part of the development of this site. The indicative development locates these facilities between the school and sporting fields, centrally within the site. This would allow a synergy between the school and the community facilities and give the school direct and easy access to the facilities.

Future growth

School sites may need to incorporate incremental growth in the future. This can be difficult to achieve when a road crossing is required. The alignment of the road to the west of the school follows the north south runway. This provides a developable area along the western boundary of the site where future incremental growth could occur.

Sporting fields

Schools are one of the major users of sporting facilities and it is proposed in the Concept Plan to locate the major sporting field adjacent to the northern edge of the school. In addition, the existing dam currently to the rear of the school will transfer to be part of the sporting facility so it can be utilised for new potable water supply.

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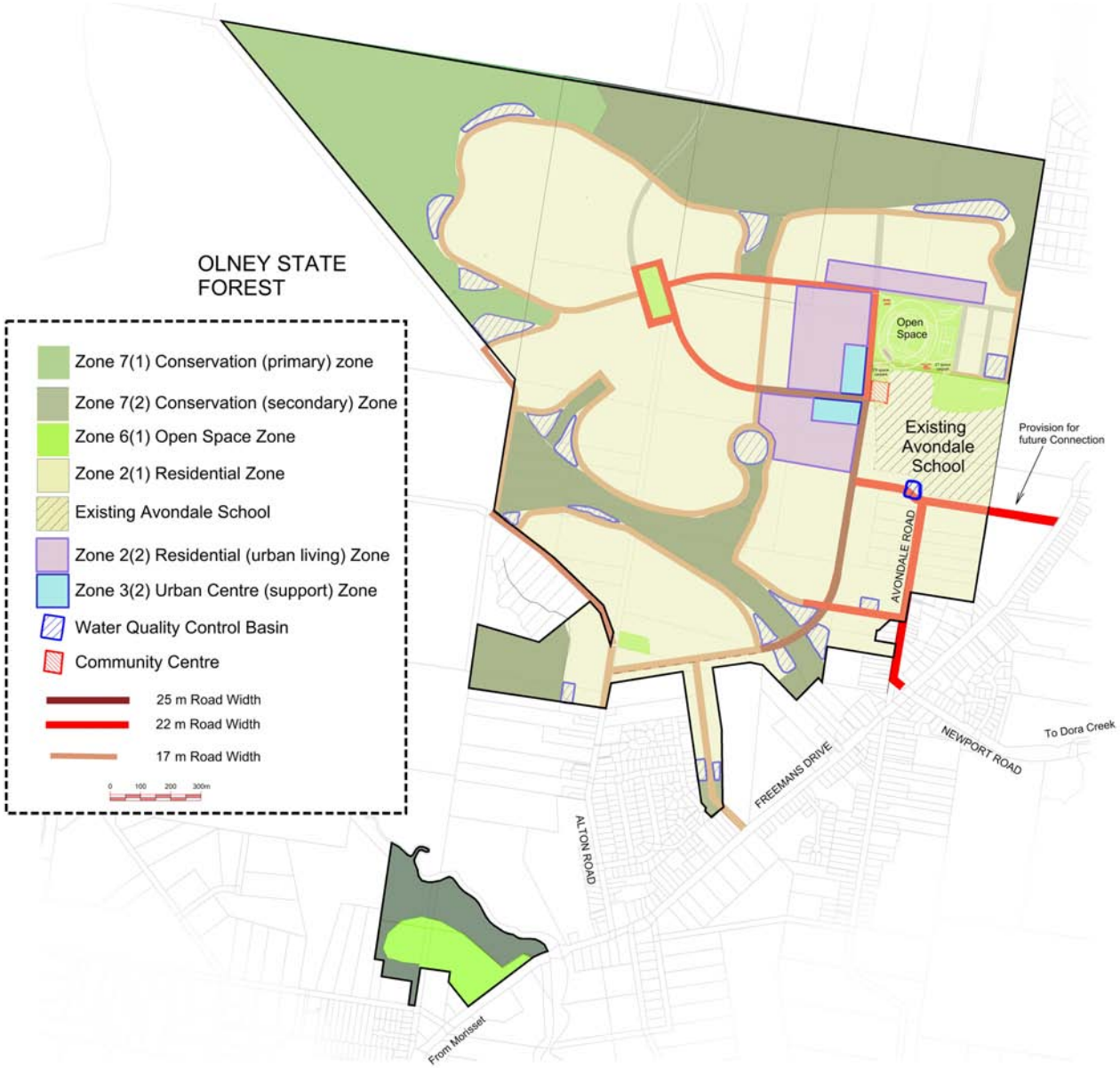

Not to Scale

Land Use	Ha	% (approx. of 364.76Ha)
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Open Space	10.8ha	3.0%
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Urban Centre (Support)	2.15ha	0.6%
Water Quality Control Basins	10.4ha	2.85%
School Site (existing)	15.1ha	4.2%
Community Facilities	0.55ha	0.10%
Residential	186ha	51%
Sub Total	**350.18ha**	
Town Common		
Environmental Conservation	8.68ha	2.38%
Open Space	6.0ha	1.65%
Sub Total	**14.78ha**	100%
Total:	364.86Ha	

LANDUSE PLAN

FIGURE 17

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5.8.2 Schools (public)

It is not proposed to provide land for a public school on the site. The Social Impact Assessment prepared by Key Insights identified that existing schools have capacity to increase their numbers. A growth in numbers for a small public school like Cooranbong Primary means the ability to attract more teachers and enhance local choices available to students. It is prudent to support the sustainability of local schools.

The trend in NSW at the moment, and in the Morisset area, is towards private education (ABS 2006). Students from this development will take up high school places at the local Avondale High, St Paul's Catholic High School at Toronto and at a variety of independent schools in both Newcastle and Lake Macquarie LGAs. Some of course will attend Morisset High School which will feel the cumulative impact of development throughout the Morisset planning district. However it cannot be assumed that all high school students in North Cooranbong will attend Morisset High.

5.8.3 Community Facilities

The community facilities proposed in the Structure Plan area:

- Construct a multipurpose centre to provide meeting space of 914m²
- Youth centre with an area of 136.5m² will be incorporated in the multipurpose centre.

Upon completion, maintenance of the above facilities will be undertaken by the proponent for a period of 5 years from practical completion of each facility. The management of the above facilities will be transferred to Council upon completion.

Land will also be provided in the development for construction of child care centres. However, it must be pointed out that existing child care centres in Cooranbong are not at capacity and full occupancy of these centres is supported in preference to providing child care centres upfront on the site.

Refer ***Figure 18*** – Community Centre Plan

5.8.4 Open Space / Conservation

Retained landscape, open space and community facilities will provide for recreation and conservation needs.

Recreation facilities would possibly include:

- 2 x cricket wickets / Sports Ovals

- Multi purpose courts
- Skate park
- Day exercise area
- Playgrounds

Upon completion, maintenance of these facilities will be undertaken by the proponent for a period of 5 years from practical completion of each facility. The management of the above facilities will be transferred to Council upon completion:

- Subject to any agreement made within a regional planning agreement, land zoned 7(1) Conservation (primary) will be transferred to the NSW Department of Environment and Conservation who will be responsible for future management and maintenance. This solely relates to the proposed conservation land part of the triangular parcel of land in the north-west corner of the site and abuts Olney State Forest, commonly referred to as "Masons" land.

- Subject to any agreement made within the local planning agreement, land zoned 7(2) Conservation (secondary) be progressively transferred to Lake Macquarie City Council along with an endowment fund. Funding for rehabilitation and maintenance of this land will also form part of the local VPA and such rehabilitation and maintenance work will be carried out by the developer as works in kind.

As previously outlined, roads will only be able to cross conservation land where shown on the Concept Plan. As shown on the Concept Plan, a services easement is also required to connect to the site from Mt Nellinda Road.

Refer ***Figure 19*** – Open Space Plan

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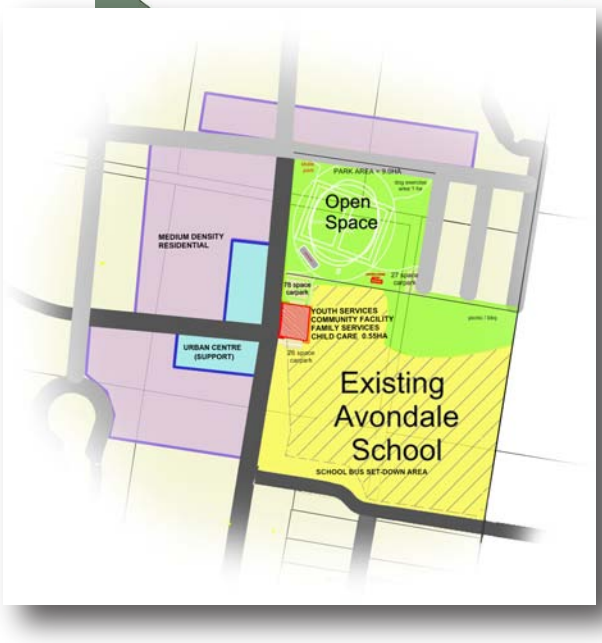

COMMUNITY CENTRE PLAN

FIGURE 18

- Youth & Community Facilities
- Urban Centre (Support)
- Open Space
- Residential
- Existing School
- Residential (Urban Living)

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- Zone 7(1) Conservation (primary) zone
- Zone 7(2) Conservation (secondary) Zone
- Zone 6(1) Open Space Zone
- Zone 2(1) Residential Zone
- Existing Avondale School
- Zone 2(2) Residential (urban living) Zone
- Zone 3(2) Urban Centre (support) Zone
- Water Quality Control Basin
- Community Centre

OPEN SPACE PLAN

FIGURE 19

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5.8.5 Employment Land

The proposed residential development on the site is located in relatively close proximity to employment opportunities within Cooranbong, Morisset and the Morisset Industrial Estate which is located adjacent to the F3 freeway. The existing range of employment opportunities offered within Cooranbong include the existing retail centre, the primary and secondary schools, the Avondale School, employment related to aged care facilities in the area and the Sanitarium Health Foods factory. The proposal will have the effect of allowing people to locate in close proximity to these existing employment opportunities.

The proposal also provides opportunities for employment on the site in the form of non-employment centre based employment such as home based businesses and home based industries. The proposal is consistent with the Lake Macquarie Non-Centre Employment Strategy, which recommends that 2.15ha employment land on site has been defined on site to cater for the needs of the community. It is expected that future businesses within the zone will not compete with existing businesses in the Cooranbong retail Village.

5.9 Indicative Project Staging

The staging of the proposal is likely to be undertaken in 11-12 precincts of up to 200 lots each. Each precinct will then be divided into approximately 8 stages of 25 lots. This is subject to market forces and is outlined in ***Figure 20*** – Staging Plan.

5.10 Site Analysis

Following from the site constraints study ***Figure 21*** shows general site constraints that have been considered in the formation of the concept plan.

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INDICATIVE PRECINCT PLAN

FIGURE 20

Not to Scale

Development Precincts

The North Cooranbong Indicative Precinct Plan shown is indicative of the likely Precincts to be developed throughout the course of the project. Development of each Precinct may not occur in the numbered order as shown above and whilst adjoining properties are shown as Precinct 11 there is no limitations in the North Cooranbong proposed development that would prevent the Precinct 11 lands from development at any given point for the duration of the project.

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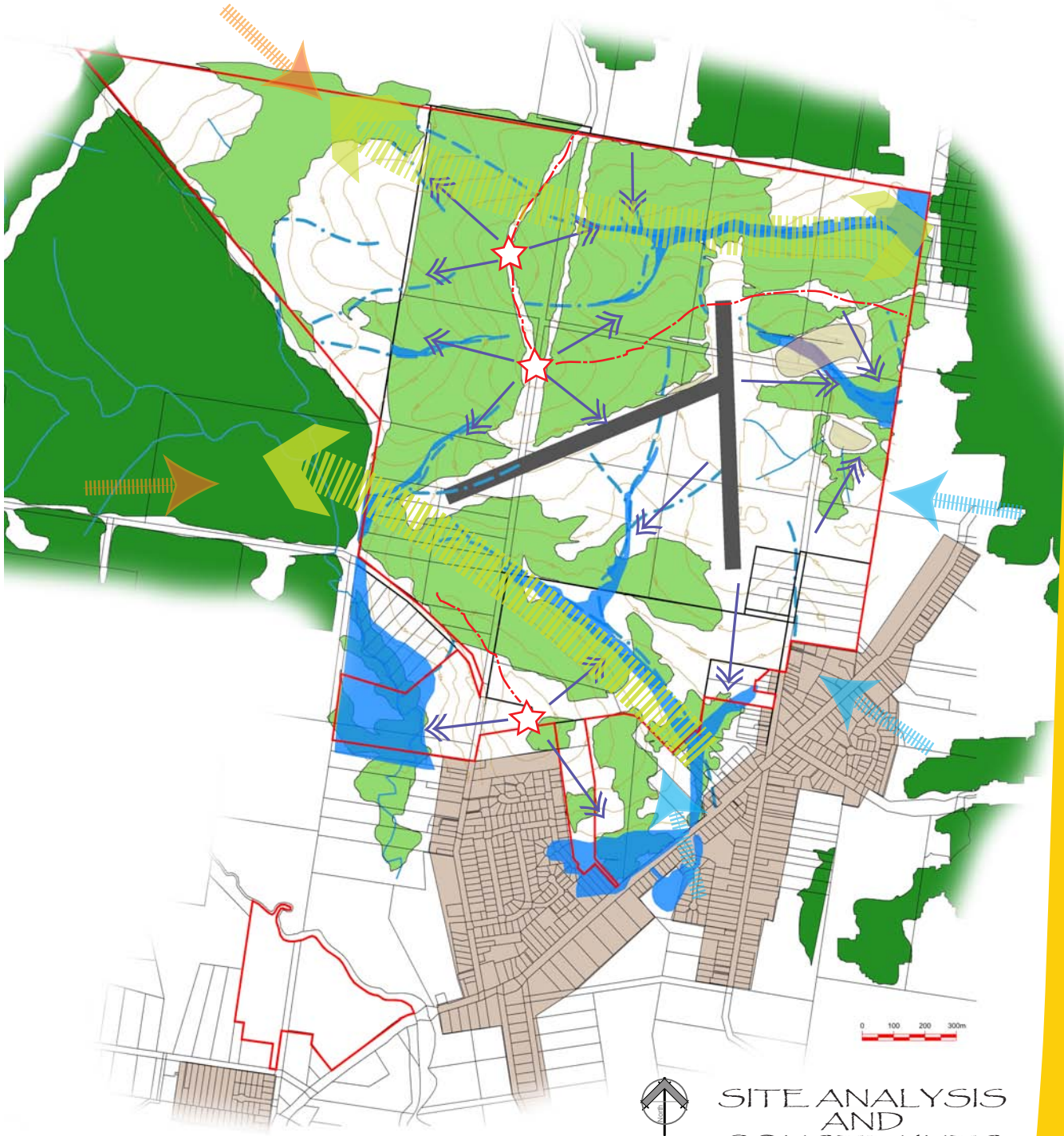

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SITE ANALYSIS AND CONSTRAINTS PLAN

FIGURE 21

- SITE BOUNDARY
- SITE WOODLAND
- ADJOINING WOODLAND
- CONTAMINATION
- 1:100yr FLOODING
- EXISTING RESIDENTIAL LAND
- EXISTING RUNWAYS
- HIGH POINT
- RIDGELINES
- DRAINAGE LINES
- SLOPE
- VEGETATION CORRIDOR
- WINTER WINDS
- SUMMER WINDS

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6.0 GOVERNANCE AGREEMENTS & VOLUNTARY PLANNING AGREEMENTS

6.1 Introduction

The North Cooranbong project will create approximately 2500 residential lots in varying sizes together with community facilities and environmental areas. Clearly this project represents a major land release in the locality in accordance with the Lower Hunter Regional Strategy and acts as the backbone to the Emerging Major Centre of Morisset.

The current developer contributions plan for Lake Macquarie City Council (Citywide No. 1) had not anticipated such a significant development occurring in this area. Therefore levying contributions for a new development in accordance with the Citywide Plan would not provide the facilities to meet the needs of the new residents.

Council officers have been in discussions with Johnson Property Group (JPG) since late 2006 regarding developer contributions in relation to this development. As a result of these discussions, JPG has offered to enter into a Voluntary Planning Agreement (VPA) with Council, in lieu of Section 94 (s94) contributions.

The provision of local infrastructure is a shared responsibility between Local Government, in this case Lake Macquarie City Council and the Developer. The development where practical, should not create additional pressure on existing infrastructure or resources. Council and JPG have an in-principle agreement on the services to be provided as a result of this development. To ensure that the services are delivered in a timely fashion, and to meet the demands of the growing community, JPG will construct most of the infrastructure as works in kind.

6.1.1 Draft Voluntary Planning Agreement

A draft Local Voluntary Planning Agreement is currently being prepared in relation to the proposed development. This document will examine the provision of local infrastructure and provides an outline as to how each item will be delivered. Note that this document is a draft version and has not been exhibited for public comment. It is subject to exhibition and final approval of Council and JPG.

It is envisaged that the North Cooranbong project will be developed in precincts over a 20 year period. Market forces will determine the pace of development and some flexibility will be required in the timing of the contributions.

Overall, and in broad terms, the project will provide the following infrastructure:

- Onsite Neighbourhood Park, Dog Exercise Area and Sporting Complex;
- 2 x Local Parks;
- Offsite Neighbourhood Park and Sporting Complex (referred to as Cooranbong Town Common);
- Cycleways;
- Contribution toward district jetties;
- Contribution toward regional Open Space;
- Onsite Multi-purpose Centre;
- Contribution to existing Libraries;
- Community Bus and Community Worker;
- Roads and Traffic Management upgrades.

This calculates to an average of $25,000 / lot, based on a maximum of 2500 lots.

These works have the support of Lake Macquarie Council per a Council resolution on Monday 10 December 2007.

This does not include contributions to regional infrastructure.

7.0 ENVIRONMENTAL ASSESSMENT

7.1 Director Generals Environmental Assessment Requirements

The following table, **Table 11,** outlines the Director Generals Requirements for the Environmental Assessment on the concept plan. These requirements have been addressed in this document. The right-hand column indicates the section/s of this document where responses to the Director Generals Requirements may be found.

Table 11 – Director Generals Environmental Assessment Requirements

Major Project No.	MP07_0147 (Concept Plan)	**Relevant Section**
General Requirements	The Environmental Assessment (EA) must include	
	(1) An executive summary;	**Executive Summary**
	(2) A detailed description of the project including:	**5.0**
	(a) strategic justification for the project;	
	(b) the various components and stages of the project in detail (eg land uses, infrastructure and dedications)	
	(3) A consideration of the following with any variations to be justified:	**3.0**
	(a) all relevant State, Regional and Local (including Draft) Environmental Planning Instruments	
	(b) all applicable Planning Strategies such as the Lower Hunter Regional Strategy and Lake Macquarie City Council's Lifestyle 2020 Strategy	
	(c) all applicable s117 Directions and DoP Circulars	
	(d) Environmental Protection and Biodiversity Conservation Act 1999.	
	(4) An assessment of the social, environmental and economic impact of the proposal with particular focus on the Key Assessment Requirements outlined below.	**7.0**
	(5) A draft Statement of Commitments, outlining commitments to manage, mitigate and /or monitor the social, environmental and economic impacts of the project with a clear identification of who is responsible for these measures and when the commitments will be fulfilled	**8.0**
	(6) A report from a quantity surveyor identifying the capital investment value for the works outlined in the concept plan	**Appendix T**
	(7) An indication of employment generated by the project.	**7.10**
	(8) A conclusion justifying the project having regard to the General Requirements above.	**9.7**
	(9) A signed statement from the author of the EA certifying that the information contained in the report is neither false nor misleading	**Declaration**

Key Assessment Requirements	The Environmental Assessment must address the following key issues:	
	1. Site Analysis	**2.0**
	(1) Undertake a site opportunity and constraints analysis that identifies the relevant natural and built environmental features within and adjoining the Site.	
	(2) The site analysis should form the basis for justifying the configuration of the development of the land and the mix of land uses.	
	2. Urban Design	**5.0**
	(1) Provide a plan showing the proposed development and conservation footprints, their areas and proposed zonings.	
	(2) Provide an indicative lot, open space and street layout and nominate indicative total lot yield, mix and density.	
	(3) Demonstrate a range of housing will be made available on site	
	(4) Demonstrate compliance with the Urban Design and Neighbourhood Planning Principles and density provisions contained in the Lower Hunter Regional Strategy.	
	(5) Develop conceptual design guidelines for housing and open space (both public and private realm) and identify how the design guidelines will be implemented.	
	3. Visual Impact	**7.12**
	(1) Identify any visual impact created by the project and mitigation measures.	
	4. Open Space and Facilities	**5.8.4**
	(1) Provide details of publicly available open space and facilities to be provided, long term management and maintenance arrangements and proposed ownership.	
	5. Utilities and Infrastructure	**7.7**
	(1) Provide a utility and infrastructure servicing strategy identifying existing capacity and any necessary staged augmentation.	
	(2) The strategy should include means for a recycled water service.	
	6. Drainage, Stormwater and Groundwater Management	**7.4**
	(1) Provide a drainage, stormwater and groundwater management strategy identifying measures to be incorporated on site, including on site stormwater detention and WSUD measures	
	(2) The strategy should demonstrate compliance with the principles of the NSW Groundwater Policy Framework.	
	7. Flooding	**7.4**
	(1) Identify and address any potential flooding risk faced or created by the project.	

	8. Biodiversity (1) Address the impact of the development on existing native flora and fauna and their habitats, including identified threatened species, having regard to the Threatened Species Assessment Guidelines and recommend a biodiversity conservation strategy including offset and/or rehabilitation measures to avoid or mitigate impacts on threatened species and their habitat. (2) Consider the development of ecological corridors to link flora and fauna corridors within the site and to adjoining sites. (3) Consider and mitigate any impact upon watercourses and associated riparian buffer / vegetation (4) Identify the intended ownership and long term management (including funding arrangements) for conservation lands. (5) Comprehensively address potential impacts on, and proposed mitigation measure for listed threatened species under the EPBC Act (including *Angophora inopina, grevillea paviflora subsp. Paviflora and Tetratheca juncea).*	**7.3 Appendix B-C (including all sub appendices)**
	9. Contamination, Geotechnical and Mine Subsidence (1) Provide a report detailing the suitability of the site for its proposed uses having regard to matter such as erosion hazard, slope stability, uncontrolled fill, soil reactivity, saturated soils, acid sulphate soils, mine subsidence and site contamination. (2) Demonstrate that suitable measures will be made in accordance with SEPP 55 to address any contamination issues.	**7.5**
	10. Bushfire (1) Demonstrate compliance with *Planning for Bush Fire Protection 2006* (2) Identify ownership and ongoing management of any proposed APZs	**7.6**
	11. Heritage (1) Identify and assess any items of European and Indigenous heritage on site and any potential impacts created by the project. (2) Provide an assessment against DECCs draft *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation.*	**7.8**
	12. Traffic and Transport (1) Prepare a Traffic Study in accordance with RTA's *Guide Traffic Generating Developments* (2) Prepare a TMAP which addresses the requirements covered in the Interim TMAP Guidelines which are available at www.transport.nsw.gov.au	**7.2**
	13. Social Infrastructure (1) Demonstrate there will be sufficient social services and infrastructure to support the population generated by project.	**7.9**

	(2) Identify positive & negative impacts and the means to mitigate any negative impacts	
	14. Employment	**7.10**
	(1) Identify and address the employment needs of the incoming population.	
	15. Commercial Development	**7.10**
	(1) Justify the amount and type of commercial development proposed by the project both in terms of the ongoing economic viability of existing commercial development and the objectives of the Lower Hunter Regional Strategy.	
	16. Planning Agreements and /or Developer Contributions	**8.0**
	(1) Provide the scope and justification for any planning agreement(s) (should one or more be proposed) between the proponent, Council and other Agencies for matters such as regional and local infrastructure, social infrastructure, public transport, recreational and community facilities and the like.	
	17. Ecologically Sustainable Development	**7.11**
	(1) Demonstrate how the development will commit to ESD principles.	
	18. State Significant Site (SSS)Study	**Appendix F**
	(1) As outlined in correspondence from DoP to JPG dated 8 November 2007 a SSS study is required to be prepared by the proponent	
	(2) This SSS study should be completed and submitted concurrently with the Environmental Assessment. This will enable joint assessment and concurrent exhibition of the EA and SSS study.	
Consultation Requirements	An appropriate and justified level of consultation should be undertaken with the following relevant parties during the preparation of the environmental assessment, having regard to any previous consultation. *a) Agencies and other authorities:* • Lake Macquarie City Council • NSW Department of Water and Energy • Hunter Water Corporation • NSW Ministry of Transport; • NSW Roads and Traffic Authority; • NSW Department of Education and Training; • NSW Department of Conservation and Climate Change; • NSW Rural Fire Service; • Commonwealth Department of Environment and Water Resources and • All relevant utility providers. *b) Public* Document all community consultation undertaken to date or discuss the proposed strategy for undertaking	**1.4**

	community consultation. This should include any contingencies for addressing any issues arising from the community consultation and an effective communications strategy. The consultation process and the issues raised should be described in the Environmental Assessment.	

7.2 Traffic & Transport

Traffic Investigations for the North Cooranbong Development have been initially completed by *GHD* and peer reviewed by *Better Transport Futures*. This work covered a comprehensive investigation of the road based traffic implications of the development and included recommendations on the most appropriate level of road and intersection upgrades to support the development.

The upgrading of local road infrastructure has been agreed to between JPG and Lake Macquarie Council as per the recommendations of the Traffic Investigations, which have also been the subject of review by the NSW RTA.

In addition to the road based investigations, and as required by the Director Generals Requirements, *Better Transport Futures* have prepared a draft Transport Management and Accessibility Plan (TMAP) for the Morisset area with reference to the specific initiatives that can be developed as part of the North Cooranbong Development. This work has been conducted in consultation with the NSW Ministry of Transport (MoT) and Railcorp. The TMAP investigations have considered the wider transport implications of the Morisset area in relation to the Lower Hunter Strategy.

The traffic and transport implications of the proposal as investigated by *Better Transport Futures – Mark Waugh Pty Ltd,* are attached as ***Appendix R & R(i).***

The existing access and transport facilities servicing the subject site are briefly outlined as follows.

7.2.1 Existing Traffic Data

An indication of the existing traffic conditions on the road system in the vicinity of the site is available in terms of Annual Daily Traffic Volumes (AADT) compiled by the Roads and Traffic Authority, as detailed in the following table.

Table 12 – Existing Average Daily Traffic Volumes (AADT)

Location	Freeman's Drive at Stockton Creek Bridge	Freeman's Drive north of Mandalong Road
Survey Station	05.629	05.628
1988 (AADT)	12,572	8,682
1990 (AADT)	-	-
1992 (AADT)	-	-
1995 (AADT)	-	1,941
1998 (AADT)	-	2,233
2001 (AADT)	-	2,573

Source: Roads and Traffic Authority of NSW "Traffic Volume Data for Northern Region" - 2001

The above information demonstrates that traffic volumes along Freeman's Drive has dramatically reduced since the opening of the F3 Freeway and the removal of through regional bound traffic movement.

7.2.2 Traffic Generation

The following information in relation to trip generation has been based on the total development yielding 2,500 lots. The use of the RTA Guide to Traffic Generating Developments is considered to provide a reasonable base for assessment of traffic implications of development.

The RTA Guide states that the weekday peak hour vehicle trip generation rate for dwelling houses is 0.85 per dwelling. It also states that for residential subdivision about 25% of these trips could be internal to the subdivision area, representing local shopping, school and social trips. The proposed concept plan provides a mixture of land uses, including commercial and a school, which may assist in the containment of trips within the subject development. It is therefore considered appropriate that this discount be applied. The TMAP investigations completed by Better Transport Futures have considered this reduction in trip generation in the context of the wider transport initiatives that are being considered for the Morisset area as they relate to the North Cooranbong site. This can lead to a further reduction in car based trip generation from the development.

With the application of the 25% reduction, the applicable discounted weekly traffic generation rate for use in the assessment is therefore calculated to be 0.64 trips per dwelling.

The application of this traffic generation rate to the anticipated development yield of 2,500 dwellings and assuming a 90% / 10% outbound / inbound split during the morning peak hour (reversed during the evening peak hour) provides the following estimate of vehicle movements:

- AM peak hour: 1,440 outbound 160 inbound

- PM peak hour: 160 outbound 1,440 inbound

It was noted in the traffic investigations that as a comparison LMCC DCP No. 1 states a trip generation rate of 8.0 trips per dwelling for residential dwellings, which is lower than the RTA rate. Applying this rate for the subject development and using a similar proportion of peak hour trips as the RTA (9.0 / 0.85) would give a trip generation of 0.75 trips. Applying the same internal trip confinement factor of 25% would give external trips of 1406 two-way vehicle trips. This is then potentially over 12% less than the rate applied within the BTF analysis.

For a development of the size and scale planned at North Cooranbong the level and variety of activities available on site will result in a significant level of trip containment. This will include trips to facilities such as local shops, education facilities, recreation activities and some locally based employment. The net result of this mix of land use is to achieve a trip containment level that could be even more favourable than the applied rates from the RTA's Guide to Traffic Generating Developments. This factor and other transport initiatives are discussed in detail in the BTF TMAP report.

7.2.3 Potential Traffic Impacts

Morisset was highlighted in the Lower Hunter Regional Strategy as an emerging major growth centre, both in terms of population but also as one of 6 important regional centres across the region. This factor alone is likely to result in shorter travel patterns, with more local jobs and activities containing movements to the Morisset area, rather than further a field. For example, travel to the nearest centres of Toronto, Warnervale and Wyong will most likely be replaced by more local activities.

There is also likely to be a shift in travel patterns, both car based and public transport based, as a result of this shift in development patterns in the Lower Hunter Region.

The Lower Hunter Regional Strategy sets the framework for development over the next 25 years. The strategy identifies a series of key centres across the region. Growth in these centres, coupled with the continuing growth of centres such as Wyong and Warnervale on the Central Coast will alter the distribution of travel across the region, from current (historic) tends.

Centres that are likely to develop stronger attractions for the North Cooranbong area include Morisset, Glendale and Warnervale. The role of Morisset is planned to change significantly and it is likely to see a shift in travel patterns to these growing centres away from traditional centres such as Toronto. It is therefore

considered that there will be a tendency for trip distribution and assignment to have a stronger connection with Morisset.

Another factor is the State Government Transport Strategy – Action for Transport 2010 and its objective for achieving moderation in traffic growth, coupled with encouragement of alternate travel to the private car.

The assessment of the traffic implications of the proposal imply that there will be a more efficient use of existing assets, rather than the provision of unnecessary infrastructure that continues to reinforce the car based travel choice.

More details on the relationship of the North Cooranbong Concept Plan to these regional factors from a transport perspective are contained in the BTF TMAP report.

7.2.4 Public Transport

Rail Services

Cooranbong is located near two railway stations (Morisset and Dora Creek) which are serviced by regional and intercity type rail services. Dora Creek, providing local services, is situated approximately 4km east of the site and currently has the capacity to offer a park and ride opportunity with rail. Morisset Station provides access to local and regional services on the Newcastle to Sydney line. It is located approximately 6km south east of the site and offers and higher frequency train service, district facilities and bus connections. Morisset Station has disabled access and a large commuter carpark.

Bus Services

Cooranbong is currently serviced by Morisset Bus Company which operates along the Freeman's Drive Corridor, linking Cooranbong with Morisset (Route No. 280). The 280 Timetable currently offers approximately 10 services in each direction per day. This service does not operate on weekends and is designed to connect with the train timetable at Morisset Train Station.

TMAP Initiatives

The TMAP investigations for the Morisset area have been based on the following key initiatives:

1. TMAP coverage of Morisset Regional Area covers Morisset Peninsula, Dora Creek, North Cooranbong, Morisset
2. Development of Morisset Railway Station by Railcorp as a regional transport interchange, supporting bus/rail interchange
3. Transport Corridor – North Cooranbong to Morisset via Freemans Drive
4. Transport Corridor – North Cooranbong to Dora Creek via Newport Drive
5. Transport Corridor – Morisset Peninsula to Morisset via Fishery Point Road

6. Localised Intersection Improvements are focussed on providing Bus Priority (proposed Traffic Signal upgrades will allow this priority to be achieved)
7. Consistent Bus Stop Furniture along all routes
8. Contribution to promotion and education of public transport services in the early stages of development

Details of the contribution of the North Cooranbong development to these regional transport initiatives, which focuses on the North Cooranbong to Morisset corridor, are contained in the BTF TMAP report.

The following table summarises the initial recommendations for TMAP works, and the relationship to the previously recommended local road improvements associated with the development.

Table 13 – Transport Improvements.

LOCATION	Existing Control	Road Proposal	Comments	Proposed Delivery Method	COSTS
A. LOCAL ROADWORKS					
1. Freemans Dr / Avondale / Newport Rd	Priority	Priority	▪ Interim upgrade to priority control	Works in Kind	·
2. Freemans Dr / Avondale / Newport Rd	Priority	Signals	▪ Ultimate upgrade to signal control	Works in Kind	·
3. Freemans Dr / New Site Access (Central)	-	Priority	▪ New Priority Control junction	Works in Kind	·
4. Freemans Dr / Alton Rd	Priority	Signals	▪ Upgrade to signal control LHT Slip Lane into Alton from Freemans Dr	Works in Kind	·
5. Freemans Dr / New Site Access (North)	-	Priority	▪ New Priority Control junction	Works in Kind	·
6. Freemans Dr / Deaves Rd	Priority	Signals	▪ Upgrade to signal control ▪ LHT Slip Lane into Deaves from Freemans Dr ▪ B Phase both direction in Freemans Dr	Works in Kind	·
7. Freemans Dr / Stockton St	Priority	Rbt	▪ Roundabout control ▪ Traffic Signals are a possible alternate control ▪ LHT Slip Lane Freemans Dr to Stockton St	Works in Kind	·
TOTAL AGREED LOCAL ROADWORKS				**$14.4 Million**	**$14.4 M**
B. RTA ROADWORKS					
8. Mandalong Rd/ Wyee Rd/ Freemans Drive	Roundabout	Signals	Ultimate upgrade to signal control	Works in Kind	·
9. Mandalong Road Upgrade	2 lanes	4 lanes	Upgrade road capacity	Works in Kind	·
10. Wangi Rd / Wamsley St / Dora St	Priority	Signals	Upgrade of junction control at Dora Ck	Works in Kind	·
TOTAL RTA ROADWORKS					**$28 M**
C. CYCLING FACILITIES		**Funding Basis**	**Proposed Delivery**		

1. West side of development to Town Common	s94 Contribution	Works in Kind	
2. West side of development to Town Common	s94 Contribution	Works in Kind	
3. Town Common to Primary School	s94 Contribution	Works in Kind	
4. Town Common to Town Centre	s94 Contribution	Works in Kind	
5. Town Centre to Town Common	s94 Contribution	Works in Kind	
6. Town Centre to Avondale College	s94 Contribution	Works in Kind	
7. Town Centre to Central Drive	s94 Contribution	Works in Kind	
8. Central Drive to Morisset	s94 Contribution	Works in Kind	
TOTAL CYCLE WAYS	s94 Contribution	Works in Kind	**$ 5.9 M**
D. PUBLIC TRANSPORT			
Public transport infastrucutre is under negotiation with the Ministry of Transport and Department of Planning and the final details will be documented as part of the Regional Voluntary Planning Agreement for the proposal.			
TOTAL TRANSPORT CONTRIBUTIONS			**$ 48.3 M**

7.2.5 Traffic Conclusions & Recommendations

The proposed Site Access Plan – ***Figure 16***, illustrates the access arrangements for the proposed North Cooranbong proposal.

- Alton Road will provide a local street connection into the south west corner of the subject development. It is considered that the internal road network is orientated to downplay the function of this link and make it less attractive as a route due to the longer travel distance between the development cells and Freemans Drive via alternative routes. This should reinforce the local road function. The retention of the existing intersection layout of Freeman's Drive / Alton Road stop line controlled arrangement should not encourage excessive levels of vehicular usage through this intersection. This approach is considered more suitable to balance traffic demands across alternative access points rather than build in potentially unpopular and high maintenance traffic control devices into new development.

- It is proposed to provide a new access to the north east of the Alton Road intersection, as shown in ***Plan 22***, which will provide a new access into the proposed development from Freemans Drive in a northerly direction. This will function as a lower category local road within the internal road network. Residents with a frontage to this new road, will be able to have direct access and as such this will limit through traffic flows.

- It is proposed to utilise a realigned Avondale Road to connect the subject development site to Freemans Drive and Newport Road, as shown in ***Plan 23***. This link constitutes one of two main access points to the subject development site and provides a higher order collector road function. The orientation of the concept plan and the internal road network would ensure

that this link is one of the main corridors of movement between the subject development and Freemans Drive and Newport Road. It is considered that the ultimate layout of the realigned Avondale Road with Freemans Drive and Newport Road will provide sufficient capacity to provide minimal delays to reinforce the main role of this link.

- It is also proposed to provide a potential new connection to the north of Newport Road which will provide the second main access point to the development. The orientation of the road network reinforces this link, particularly for traffic movements to and from the north.

- Local road and intersection upgrades will include contributions to the development of improved infrastructure for local bus services along the nominated corridors between Morisset and Dora Creek.

In conclusion, it is considered that the elements of the site concept plan and the orientation of the internal road network will be sufficient to reinforce the intended role of each of the four access points in terms of their functional classification within the concept plan area and to minimise the amenity impacts on surrounding residential properties to satisfactory levels. These together with the North Cooranbong transport improvements contributing to the Morisset TMAP will provide a positive contribution to transport movements for the site and within the Morisset area.

Not to Scale

- 1.00 INFRASTRUCTURE - ROAD NETWORK
- 1.02 Freemans Drive - New Access

The North Cooranbong development proposed by the Johnson Property Group will require a new access point off Freemans Drive. Preliminary studies by GHD indicate that several roadway upgrades will be required.

GHD have prepared the above preliminary Freemans Drive new access intersection design including signalisation.

INTERSECTION PLAN 02

FREEMANS DRIVE NEW ACCESS INTERSECTION PRELIMINARY DESIGN

FIGURE 22

Not to Scale

- 1.00 INFRASTRUCTURE - ROAD NETWORK
- 1.01 Avondale Road ~ Freemans Drive

Preliminary studies into the North Cooranbong road network by GHD for the Johnson Property Group indicate that several roadway upgrades will be required.

GHD have prepared the above preliminary Avondale Road ~ Freemans Drive intersection design including signalisation.

INTERSECTION PLAN 01

AVONDALE ROAD ~ FREEMANS DRIVE INTERSECTION PRELIMINARY DESIGN

FIGURE 23

7.3 Biodiversity, Flora & Fauna

With the closure of the Avondale Aerodrome imminent in the years prior to 2004 the subject site was identified by Lake Macquarie City Council for potential future urban use as evident by the rezoning of the site to an Investigation Zone, under the LMCC LEP in 2004. This rezoning was based on several characteristics of the site which made it suitable for future urban development despite the need for additional ecological information. As part of the rezoning process a number of ecological studies were undertaken by *Anne Clements & Associates Pty Ltd, Harper Somers O'Sullivan (HSO) & . Austeco Pty Ltd.* This included flora and fauna assessments undertaken over various parts of the site twice in 2002 and again in 2003. These reports provided background information relating to the ecology of the site.

In December of 2004, and as part of a previous zoning scheme outcome, *Anne Clements & Associates Pty Ltd* prepared a site wide flora assessment which included a review of that information previously collected on the site, and supplementary information resulting from additional site specific studies. The need for flora and fauna assessment focused on a concept plan model and not the rezoning model was apparent. Anne Clements & Associates prepared subsequent assessments of the flora of the triangular lot, and HSO, a flora and fauna assessment of the Town Common Site (which is sited separately to the main area of the concept plan). In relation to fauna on the main site, *Austeco Pty Ltd* where engaged to provide an in depth assessment of the North Cooranbong Concept Plan area. As the bulk of the triangular and town common sites are to be set aside for conservation and open spaces respectfully, this assessment of the biodiversity will focus on the concept urban areas and the potential impact of the concept plan.

As previously discussed in previous sections of this report, the directions of DoP and DECC are more clearly defined for the Lower Hunter now as a result of the release of the Lower Hunter Regional Strategy and the draft Regional Conservation Plan. As a result of the objectives of these two state planning documents, the previous zoning scheme needed to be revisited and discussions between the proponent, DECC and DoP commenced to see how the site could be developed to maximize its potential whilst still achieving an environmental outcome.

In a letter from the DECC to the proponent (27th Nov 2007), the DECC indicated that an adequate and in-depth level of ecological data would be required to properly inform the decision making process as such a depth of knowledge had not been gathered to date. An extract of this letter relevant to the North Cooranbong site is shown below. To demonstrate that such a bank of knowledge exists the following is a chronology of ecological investigations including those discussed above and investigations undertaken after the aforementioned letter was received by the proponent:

DECC to JPG – 27th Nov 2007

North Cooranbong –From the information currently available, it is clear that this site is highly constrained by biodiversity. The site contains endangered ecological communities and threatened species listed under the *Threatened Species Conservation Act 1995* and the *EPBC Act 1999*. It is therefore imperative that an appropriate level of in-situ protection is provided for these biodiversity values.

Given the significant values exhibited on the site, it is important that adequate site scale data is available to inform any decision on final development footprints. In this regard, we note that the surveys which have been conducted to date provide sufficient detail to inform final negotiations on development areas.

We are therefore seeking further information, particularly with regard to distribution of *Angophora inopina*, which can be used to refine final development footprints. In this regard, we note that the north western corner and northern boundary of the site appears to contain areas of significant biodiversity value, which should be the focus of conservation efforts.

Nonetheless, DECC acknowledges that additional areas can be developed, as shown in the attached map. Specifically, the proposals around the open space/existing school in the eastern part6 of the land are supported. It is recognised that there are some threatened species in these areas, and again, any biodiversity values that may be lost or impacted will have to be offset.

DECC

2004

- Anne Clements and Associates Pty Ltd, North Cooranbong Flora Assessment – 29th Dec ***(Appendix B)***

2005

- Anne Clements and Associates Pty Ltd, North Cooranbong Supplementary Flora Assessment (triangular lot) – 9th Dec. ***(Appendix B(i))***
- Austeco Environmental Consultants, Cooranbong Aerodrome Fauna Constraints Assessment – 30th January. ***(Appendix C)***
- Forest Fauna Surveys, North Cooranbong Extension Area, 2005

2006

- URS Environmental Consultants, Local Environmental Study – North Cooranbong, Dec 2006 (incorporating additional information contained by Anne Clements & Associates and Austeco P/L).

2007

- RPS Harper Somers O'Sullivan Pty Ltd, Flora and Fauna Assessment "Cooranbong Town Common" – June. ***(Appendix B(ii))***

2008

- RPS Harper Somers O'Sullivan Pty Ltd, Distribution of Three Threatened Species – January 2008. ***(Appendix B(iii))***
    - o Incorperating - Anne Clements and Associates Pty Ltd, Targeted Ecological Survey of three Threatened Species – January 2008.
- Anne Clements and Associates Pty Ltd, North Cooranbong Flora Survey January – Februray 2008 – June 2008. ***(Appendix B(iv))***
- Austeco Environmental Consultants, Suplementary Report, Impacts of the Proposed North Cooranbong Residential Development on 3 listed Species. – 3rd June. ***(Appendix C(i))***

Note: Additional ecological constraints studies were prepared as part of a previous rezoning application for the site. While the rezoning process was not completed in light of the site being assessed under Part 3A of the EPA Act 1979, these studies were referenced in several of the above studies. The resulting reports provide a significant body of information with which to assess the Concept Plan.

7.3.1 Flora & Fauna

Flora

The Flora report for the Cooranbong Aerodrome site (Clements 2004) identified 5 vegetation assemblages within the boundaries of the site. This report is consistent with previous ecological reports for the same site (as discussed above) in that the following vegetation assemblages where identified as being present:

- Coastal plains Smoothbarked apple woodland,
- Coastal plains Scribbly Gum woodland,
- Riparian Meleluca Swamp Woodland,
- Alluvial Tall moist Forest, and
- Disturbed/cleared areas of extended human influence.

49 exotic species were identified on the subject site primarily in, and adjacent to, the disturbed areas but also to a lesser extent, within areas of the above listed vegetation assemblages. The existence and spread of these exotic species is consistent with the history of human influence on the subject site. Significant recorded communities are primarily related to the occurrence of three species which are discussed below.

In reviewing species of significance relating to the North Cooranbong Concept Plan, Clements Report (2004) identified that three (3) species of plant recorded on the site are listed as 'Vulnerable' under the Environmental Protection and Biodiversity Conservation Act (EP&BC Act, 1999) and Threatened Species Conservation Act (TSC Act, 1995):

- *Angophora inopina*; (vulnerable)
- *Grevillea paviflora*; (vulnerable) and
- *Tetratheca juncea* (vulnerable)

As the implications of the species listing under the EPBC Act is discussed in greater detail in Section 3.1 of this report, this discussion will focus on the listed species in an ecological and regional development context. Maps showing the surveyed locations of the three listed species are listed in the attached reports ***(Appendix B(iii) & B(iv)).***

In terms of soils the subject site is underlain by the *Doyalson* and *Wyong* soil landscapes (Murphy & Tille 1993) and as such contains vegetation assemblages which prefer the characteristics of these soil landscapes. These soil types are common in the region and this site has no specific differentiating qualities to other sites in the region.

Angophora inopina

Specimens of the *A inopina*, common name Charmhaven Apple, where detected during the flora surveys conducted by Clements during the 2004 and 2005 surveys. While initial recordings indicated the existence of the species additional targeted surveys were conducted in early 2008 to determine the full extent of the species. This species is endemic to the NSW Central Coast with a northern limit near Karuah, on the boundary of the Port Stephens and Great Lakes Local Government Areas. Figures (2-1 & 2-2) showing the full extent of *A inopina*'s range, including recorded specimens and potential habitat is included in the HSO 2008 report attached as ***Appendix B(iii).*** Interestingly these figures show a number of recordings of the species outside the preferred habitat indicating that potential range outside the preferred habitat may be wider still. The wide range over which potential habitat was governed was based on recordings from ecologists, preferred soil types and preferred vegetation assemblages.

The population on the subject site can be defined into three separate subpopulations based on their grouping across the site, the largest of which is located in the northwestern corner of the site (the triangular lot) which has been set aside as a conservation area under the Concept Plan. The second grouping is located in the northeastern corner over a mix of riparian, open space and proposed urban land uses. The third is located in the central-southern portion of the site. 2952 specimens were recorded on the site (Clements 2008), up to 30% of which will be protected in riparian and conservation areas.

Within the Concept Plan area a number of specimens will be displaced by the proposal although opportunities will exist within the riparian and vegetated corridors to preserve specimens and promote the growth of the species. To compensate for those specimens that will be lost as a result of the proposal, DECC have indicated a compensatory package will be required (which will be detailed in the regional voluntary planning agreement) to sufficiently demonstrate the

'maintain or improve' principle such that this concept plan provides a maintain or improve biodiversity solution.

Grevillea paviflora

This species in known to occur more centrally within the Sydney basin and has been identified as preferring the Lucus Heights and Faulconbridge soil landscapes. Within the Lower Hunter *G paviflora* is known to have a wide distribution with over 1,000,000 specimens known. Of these approximately 660,000 are found within the Hunter Economic Zone (HEZ) conservation reserve. The subject site is known to contain approximately 200 specimens (approximately 60% being in proposed conservation areas), the majority of these located within riparian areas in the south eastern section of the site. This area containing the majority of the species on the site has been dedicated a riparian corridor which will be unaffected by development allowing the majority of the species in this area to be preserved. The number of specimens effected by the concept plan represents approximately 0.3% of the known population, in this region.

Again, those areas of the concept plan which have been dedicated for conservation purposes will provide secure habitat for the species indefinably in addition to the compensatory package nominated by DECC to protect and manage the species on conservation land within the region such that this concept plan provides a maintain or improve biodiversity solution.

Tetratheca juncea

The third species of significance which was identified on the subject site in *Tetratheca juncea*, commonly known as Black-Eyed Susan. This species is listed in State and Commonwealth legislation as a vulnerable species. This species has a recognised habitat range from the Central Coast in the south to the Great Lakes in the North and has been found as far west as the Cessnock Local Government Area in the west. The species is known to be associated with the Awaba soils landscape of the northern Sydney Basin region. 32,164 specimens of *T juncea* are known to exist regionally with 31,336 of these preserved in existing or proposed conservation areas.

The subject site is known to contain approximately 139 specimens, around 37 located areas to be affected by the concept plan. This represents approximately 0.12% of the known population that will be affected by the concept plan. Again these figures are based on known populations and as there is a limited body of information pertaining to the actual population and spread of the species there is in all likelihood large unknown populations of this species located throughout its range.

Similarly to the other two species, the compensatory package nominated by DECC is aimed to protect and manage the species on conservation land within the region such that this concept plan provides a maintain or improve biodiversity solution..

The Precautionary Principle

The precautionary principle provides that if a significant amount of information does not exist in relation to a certain actions that a decisions on that action should be delayed until further information can be gathered and used to come to an informative decision. In relation to the subject site significant ecological studies have been undertaken since 2000 to determine the full extent of ecological characteristics and as such the precautionary principle cannot be seen as a preventative to the proposals determination.

On a regional scale populations of the three listed species have been documented primarily within conservation areas with the true extent of regional populations being unknown. The preceding assessment of the three species based partly on known regional populations therefore represents a very conservative estimate of the populations of these species and as such discount the need for the precautionary principle to be applied in this instance. Indeed, as more information is collected in relation to these species (including the extensive information collected as part of this environmental assessment) the compensatory package provided by the proponent can be put to use on a regional scale to fund the ongoing protection of these species.

Recommendations

Among the recommendations of the Clements report and as adopted by the North Cooranbong concept plan are:

- The inclusion of a vegetated corridor running in an east west fashion through the northern portion of the site linking the proposed conservation area(the triangular lot) with existing vegetation located to the north of the Avondale School site, and
- The clean up of the areas identified in the flora report which currently holds specimens of *Ageratine adenophora*, a noxious weed.

Despite the location of the listed species which could lead to their removal as a result of the concept plan, provision can be considered for appropriate ongiong protection to demonstrate that the maintain or improve principle has been adhered to in this instance. Additionally the conservation area offsets provided and dedicated to the DECC as part of the concept plan will ensure these species will be preserved in the locality for perpetuity.

Fauna

Dr Andrew Smith of *Austeco Pty Ltd* undertook a site specific and sub regional fauna assessment of the subject site in 2004 ('***Austeco Report'***). The subject site was divided into 4 areas for the purpose of the investigation. These areas are shown in *Figure 6* of ***Appendix C.*** Listed species found within these areas are as follows:

Area 1 – Encompassing the majority of the site:

- *Mormopterus norfolkensis* (East-coast Free-tailed Bat)
- *Calyptorhynchus lathami* (Glossy Black Cockatoo (within 100m of site boundary)

Area 2 – Including a smaller souther portion of the site:

None recorded

Area 3 – The south-western corner:

- *Miniopterus schreibersii oceanensis* (Eastern Bent-wing Bat)
- *Mormopterus norfolkensis* (East-coast free-tailed bat)

Area 4 – A small section including the southern access to the subject site:

- *Myotis adversus* (Large-footed Myotis)
- *Miniopterus schreibersii oceanensis* (Eastern Bent-wing Bat)
- *Miniopterus australis* (Little Bent-wing Bat)
- *Scoteanax rueppellii* (Greater Broad-nosed Bat)
- *Pteropus poliocephalus* (Grey-headed Flying Fox) (observed flying over the site but not on the subject site)

As described in ***Appendix C &C (i)*** all three listed species recorded as likely to frequent the site would be attracted to the Swamp Mahogany guild of vegetation which is found in limited stands on the subject site, primarily associated with riparian areas such as the northeast corner of the site. Reference is made to Figure 2, ***Appendix Ci.*** As described in ***Appendix Ci*** the majority of this vegetation community will be preserved as part of the Concept Plan. Where impacts into conservation areas are unavoidable, agreements with the DECC for regional offsets and contributions towards the preservation of similar vegetation has been provided as part fo the VPA, as detailed below.

An important feature of the concept plan which was developed with input from the DECC and advice from ecologists are the vegetated corridors as it is recognised that, there is a need to accommodate species movement through the subject site. This is demonstrated through the dedication of the entire northern boundary of the site for conservation purposes, thus preserving significant areas of vegetation

for perpetuity this important connection between vegetation on the ranges to the west, with the vegetated areas to the east, and Lake Macquarie.

In addition, DECC and the proponent are negotiating a compensatory package (which will be detailed in the regional voluntary planning agreement) to improve and maintain dedicated land on the subject site, and to secure conservation use within the region. While this shall be at the discretion of DECC it is envisaged that these funds will go toward the protection, maintenance and conservation of high quality habitat, as such demonstrating that the maintain or improve principle is met by the Concept Plan.

The long term conservation of these species can be achieved by:

- Protecting riparian habitat (using buffers of retained vegetation), Swamp Mahogany habitat, Alluvial Tall Moist forest, potential Masked Owl nest trees, and tree hollows in proportion with the area of habitat protected;
- Providing a vegetation corridor in both the north and the south of the site along the creek lines; and
- Providing a north south vegetation linkage either internal to the site or externally, provided the linkage is secured by zoning.

Town Common Site

In relation to the town common site additional ecological reporting was undertaken as included in ***Appendix B.*** This reporting concluded that the proposal would not result in a significant impact on the integrity of the local ecology. Furthermore the land was identified as being suitable for the mix of conservation and open space zonings.

Given the limited nature of the proposed development and area to be dedicated for conservation purposed on the town common site, negligible impact is anticipated.

Triangular Lot

As previously mentioned the triangular lot (located in the northwestern corner of the main Concept Plan site has been largely reserved for conservation purposes. This will improve the integrity of the northern vegetation corridor by providing a significant conservation area linking the subject site to the Olney State Forest and beyond. The area also includes a large number of *A inopina,* and its preferred habitat to aid in the preservation of this species.

7.3.2 Conservation Offsets

It is clear from the above that the regional and sub regional assessments provided by the HSO, Clements Report and the Austeco Report hold a common view, that it is important to maintain linkages between remnant vegetation communities to the

east of the site, within the site, to the Olney State Forest and ultimately, the Watagan Mountain Range to the west and north of the site.

In 2004 it was observed that the boundaries of the site (at that time) did not alone contain sufficient linkage between the vegetation east of the site and the Olney State Forest in the west. It appeared that the prospect of establishing a strong link of contiguous vegetation had been eroded by former rural activity surrounding the site, and that the subject site did not provide the requisite qualities.

However, the assessments observed an area of higher quality vegetation within land that adjoined to the west of the site that would best ensure a long term sustainable linkage was created. The vegetation was and still is zoned 1(a) Rural and remained under threat from rural activities in the mid to long term.

Based on this advice and at significant expense, the proponent (JPG) subsequently purchased the adjoining property with the aim of securing the linkage by rezoning a significant part of the land as 7(1) Conservation (Primary).

The land, reffered to as “Masons Land”, become part of the North Cooranbong site in 2005 and was studied in full detail accordingly. The proposal to rezone the linkage for conservation purposes remains part of this concept application. This area is known as the triangular parcel and the bulk of this area is to be dedicated as primary conservation zone.

Negotiations between JPG and the DECC have concluded that land along the northern boundary of the site as conservation (secondary) zone. This area will remain as an important vegetated link through the north of the site to adjoining areas of off-site ecological significance.

The combination of these conservation offsets and the compensatory package negotiated between DECC, DoP and JPG are considered to allow the ‘improve or maintain’ principle to be demonstrated in relation to the Concept Plan.

7.3.3 Regional Ecological Importance

Despite the aforementioned listed species existing on the subject site, consideration of the concept plans ecological footprint requires an assessment on a regional scale. Of the three species located on the subject site *Grevillea paviflora*; and *Tetratheca juncea* are located primarily in areas which will result in their preservation within the Concept Plan. Limited numbers of these plants will be affected directly by the purposed concept plan. The remaining species, *Angophora inopina*, is located across the site in larger numbers. On a regional scale this species has been recorded in significant stands within the Coal and Allied Gwandalan Conservation Lands where approximately 3000 specimens have been

recorded alone. It is known that the species exists in additional Conservation areas although due to a lack of targeted species surveys the true status of the species is likely to be much higher on a regional scale.

While the regional importance of the three species cannot be understated the preservation of existing population in areas of higher conservation value is required. Therefore, and as previously mentioned, it is expected that the compensatory package required by DECC will enable DECC to preserve the population which are currently not protected. In terms of the Concept Plan this is especially important for *Angophora inopina.* The compensatory package will provide funding to secure the population in the region and ensure the species longevity.

7.3.4 Regional Development Importance

While it is acknowledged that three vulnerable flora species will be affected by the concept plan the importance of the site in providing urban growth opportunities for the Lower Hunter cannot be understated. The subject site has been identified as being a significant area for accepting future residential growth in the Lower Hunter Regional Strategy. The subject site was chosen for inclusion in this Strategy due to the significant areas of disturbance and its location within a major growth area with significant population to accept growth and underpin the existing population. That is to say that although the subject site contains listed species, it does so at levels which, when compared to alternative urban growth areas in the Lower Hunter, are relatively low and therefore represent a site which will have significant benefits if developed for housing,

The need to provide housing to the growing population of the Lower Hunter cannot be understated. Specifically, the subject site is located on the boundary of the Central Coast and Lower Hunter regional areas, both of which are anticipated to face continual growth pressure originating from congested Sydney residential growth areas. Urban growth on the subject site will in turn provide economies of scale to encourage much needed services to the south lakes area.

Without the development of the proposed Concept Plan alternative sites within the Lower Hunter would be required. Despite the occurrence of three vulnerable species the subject site has experienced significant disturbance in the past, is located close to existing infrastructure and importantly, close to employment lands as proposed in the Lower Hunter Strategy. For these reasons the provision of an agreed compensatory package DECC will demonstrate that this site provides a maintain or improve biodiversity outcome and is considered to preserve the ecology of the locality and the region.

7.3.5 Conclusions & Recommendations

The above has provided an in-depth discussion of the Concept Plan in relation to ecological matters on both local and regional scales. It has been shown that through the provision of land for conservation, the inclusion of an important vegetated corridor and riparian zones, combined with an agreed compensatory package to DECC for offsite conservation, there is ample evidence that the improve or maintain principle has been met. Importantly the recommendation of the Austeco Report (2004) that a minimum of 30% of the Concept Plan is to be reserved for conservation has been met.

7.4 Water Quality Management

Patterson Britton and Partners Pty Ltd was engaged to identify and address the various water management issues associated with the proposed North Cooranbong residential development, refer ***Appendix J.***

This report outlines the water management principles that are to be adopted in the formation of a sustainable water management strategy for the North Cooranbong proposal. The water management strategy would be developed with respect to water sensitive urban design, run-off quality and quality control, potable water re-use reduction and retention / rehabilitation of creek line riparian corridors.

In particular, the report places particular emphasis on the implementation of a water-sensitive urban design approach in order to contribute to the long term sustainability of the site and its surrounding environment.

For the Town Common site, *Patterson Britton Partners Pty Ltd* have prepared a Draft Stormwater Management Plan which is attached as ***Appendix J.*** The implementation of such a plan will ensure that the quality of water leaving the site will not have a detrimental effect on the receiving catchment due to any onsite activity.

7.4.1 Current Position

The site is located on undulating terrain and as such, there are several subcatchments draining in various directions, several of which contain watercourses. Approximately half of the site drains via the main creekline to the southeast towards Freemans Drive. The remainder of the site is divided into smaller subcatchments which drain generally to the north and west.

In addition to the riparian corridors associated with the aforementioned creeklines, there are ecological corridors throughout the site.

The Environmental Protection Authority's (EPA) specific goals regarding reduction of annual pollutant loads in run-off under developed conditions are listed below.

- Total suspended sediments 80% of average annual load;
- Total phosphorus 45% of average annual load; and
- Total nitrogen 45% of average annual load

These targets represent the BASIX requirements and generally in accordance with those listed in Lake Macquarie Council's Stormwater Guidelines.

7.4.2 Implications of Concept

In order to achieve these objectives, a treatment-train (systematic treatment) approach would be implemented into the development where the stormwater treatment flow path for run-off would generally be:

1. run-off from roofed areas would be collected and detained in rainwater tanks with an overflow by-pass to the street (*bioretention*) drainage system
2. large impervious areas such as roads would be directed to bioretention swales where they would be filtered and treated biologically
3. excess flows from the bioretention swales and basins would flow into the pipe drainage system designed to cater for the 10 year ARI event
4. stormwater exiting the pipe drainage system would pass through a gross pollutant trap to remove remaining coarse sediment, litter, debris, oils and grease, and
5. stormwater would drain from the gross pollutant trap to either a wetland or a dry infiltration / bioretention basin for final treatment before discharge to the downstream system.

This site represents the opportunity to implement a water management system which would not only ensure sustainability of the development, but also contribute to an improvement in the overall environmental quality of the North Cooranbong site, the receiving waters and the surrounding areas.

The principle objectives which will be achieved through the implementation of this integrated water management plan are:

- the demand for potable water will be reduced by at least 40% compared to that of a traditional household with the introduction of water saving measures and rainwater tanks;
- the export of suspended solids, total nitrogen and total phosphorus would be significantly reduced;
- the peak flow rates of stormwater discharge from the site will be maintained at or below existing levels;
- the riparian (and ecological) corridors will be maintained; and

- the visual and passive recreational amenity of the development will be enhanced with these features.

7.5 Geotechnical & Contamination

Douglas Partners Pty Ltd were engaged to undertake an assessment of site specific geotechnical opportunities and constraints for the North Cooranbong investigation area. The subsequent report which formed the basis for the geotechnical assessment in this document, comprises information from previous geotechnical reports, and additional primary information. Previous reports used are shown in **Table 14.**

Table 14 – Geotechnical reporting history of the subject site Source: Douglas Partners Pty Ltd.

Report No	Date	Investigation Title	Description
31393	11/12/01	Preliminary Site Assessment	Lots 1 to 4, Part Lots 5 & 6, Lots 7 to 10 and Part Lot 11, DP 3533, Avondale Rd, Cooranbong
31393-1	24/1/02	Effluent Sludge Dam Assessment	Lot 10, DP 3533, Avondale Rd, Cooranbong
31498	24/7/02	Preliminary Site Assessment	Lot 1, DP 170378, Lot 2, DP 825266, Lot Pt 15, DP 182756, Lot 1, DP 348173 & Lot 21, DP 865588, Alton Rd & Freemans Dr, Cooranbong
31498A -01	1/4/03	Additional Contamination Assessment	Lot 2, DP 825266, Lot 21, DP 865588 & Lot 1, DP 348173, Alton Rd & Freemans Drive, Cooranbong
31498A -02	9/4/03	Additional Contamination Assessment	Lot 1, DP 170378, Alton Rd, Cooranbong
31498A -03	8/4/03	Additional Contamination Assessment	Lot Pt 15, DP 182756, Alton Rd, Cooranbong
31720	20/10/03	Preliminary Site Assessment	Lot 1, DP 825266
31720-1	13/11/03	Additional Geotechnical & Contamination Assessment	Lot 1, DP 170378, Lot 2, DP 825266, Lot Pt 15, DP 182756, Lot 1, DP 348173, Lot 21, DP 865588, & Lots 1 to 11, DP 3533,
39229	July 05	Preliminary Site Analysis	Lot 219, DP 755218

The primary report which forms the basis of the following discussions may be found in ***Appendix A.*** The following geotechnical aspects offer further discussion on the respective geotechnical characteristics of the site and the proposal.

7.5.1 Landform & Geotechnical Capacity

The site is underlain by Triassic aged Narrabeen Group, generally comprising chert sandstone, quartzoee sandstone, conglomerate, shale and claystone. A shallow soil profile was generally observed with silty topsoil overlaying clay and silty clay soils. Sandstone outcrops where observed at the base of some erosion scours.

Generally speaking the geology of the site means it can be readily excavated by conventional earthmoving equipment and the geology of the site does not constrain future development. Prior to future development specific site investigations should be made to quantify the exact geology of the particular area to be developed.

7.5.2 Contamination

The Douglas Partners report indicates that bird burial pits have been located on part of the site associated with previous chicken sheds. Specifically these pits are located in the southwestern corner of the subject site adjoining existing chicken sheds. To prevent any conflicting land uses in this location the concept master plan has identified this area for environmental area / open space.

Further possible contamination issues exist where a former effluent sludge disposal dam is located on the site. This area will be remediated prior to any future development in accordance with Council standards to be detailed in the development application. LMCC's development application and construction certificate reference numbers for this remediation are as follows: DA 175/2007 and SCC 90/2007

A number of car bodies of various ages have been located on the subject site. These car bodies will be removed from the site as part of the site preparation, at which time an assessment of any additional contamination, for example hydrocarbon leakages, will be assessed.

Contamination present on site is located in a smaller number of isolated locations and not strewn across the site. These can be easily targeted and remediated as development of the area occurs.

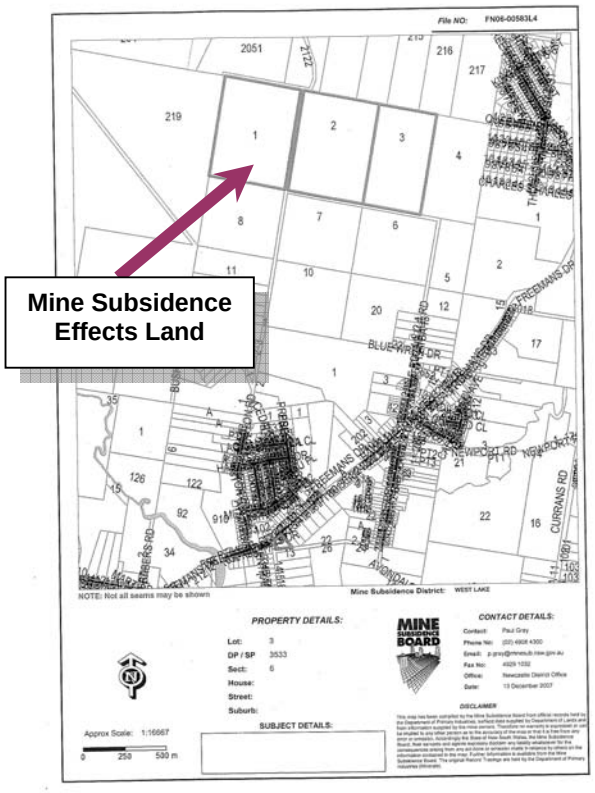
As well as these relatively minor contamination issues a number of areas have been subjected to localised filling in the past with fill appearing to be placed in an uncontrolled manner.

The geotechnical investigations attached as ***Appendix A*** includes a list of all possible and existing sources of contamination on the site (Table 3 of Appendix A). It is recommended that an additional contamination assessment be undertaken specifically relating to these issues and addressing methods to mitigate any effects these will have on the future development of the site at the DA stage for each application.

7.5.3 Subsidence

The NSW Mine Subsidence Board was contacted to provide comment on the proposal for use of the subject site for future urban development, primarily residential land use.

The Mine Subsidence Board offered the response shown in ***Appendix D.*** In summary the majority of the site is free of any mine subsidence constraints with the exception of three (3) lots shown on the following plan.



Provision has been made for these lots in the site specific DCP which requires consultation with the Mine Subsidence Board prior to the issuing of development consent.

7.5.4 Soil Erosion

As part of the geotechnical investigations undertaken in ***Appendix A***, an assessment of the erosive quality of the site was undertaken. The dominant soils of the site were identified as clays and appropriate laboratory testing was undertaken to determine the erosive potential of these soil types.

It was found that the dominant soil types on site are generally non-dispersive and therefore are not prone to erosion, however it is noted that soil exposure as a result of earthworks would make any exposed soils prone to erosion. The report notes that the soil types encountered on the site are readily amenable to erosion control techniques which will reduce the likelihood of unwanted soil movement and protect receiving waters from suspended soil sediments.

Such erosion and sediment control plans shall be furbished by the proponent prior to future works to demonstrate mitigation and control techniques to prevent unwanted soil movement, through and of the subject site.

7.5.5 Salinity

Specific investigations into the existence of soil salinity were not undertaken. However, no signs of salinity were identified on the subject site. It is recommended that further investigations take place in the future to determine the potential for soil salinity.

7.5.6 Acid Sulphate Soils

An initial assessment of the potential for Acid Sulphate Soils on was undertaken and it was determined that there is little likelihood of these soils occurring across the site. The report notes, however, that the exception to this is the extreme southeast corner of the site which has the potential to be affected by Acid Sulphate Soils according to the *Acid Sulphate Soils Risk Map* for Morisset. Specific investigations are recommended for any proposed works in these areas however unlikely the existence of Acid Sulphate Soils may be. This area has been excluded from development under the proposed concept plan and will remain environmental.

In relation to the Town Common site, geotechnical investigations undertaken by Douglas Partners Pty Ltd, ***Appendix A,*** indicated that there was the potential for ASS to be exposed during any future works on site. As such, any future works on this site will require an Acid Sulphate Soils Management Plan. The timings for such a plan are outlined in the Statement of Commitments in Section 8.0 of this report.

7.5.7 Resource Implications

The subject site is not known to hold any significant resources which the proposed development may prevent from being extracted or utilised. Test pits failed to

encounter any significant quantities of gravel which would represent the most likely resource to be found within the site boundaries.

The future development of the site for urban uses would not jeopardise the ability to utilise any significant resources, now or in the future.

7.5.8 Groundwater

Studies showed that existence of groundwater was limited across the site. Soaked soils, where encountered, were limited to gully lines and natural watercourses. The concept plan proposes the provision of water detention and quality control devices within the urban area and not in the environmental corridors. The nearest recorded bore to the site is located 150m to the south of the subject site.

In the north western corner, groundwater is some 6m below ground level and is not considered an issue. Refer ***Appendix A(ii).***

A review of the NSW Groundwater Policy Framework was undertaken as part of this environmental assessment, in particular the publication *The NSW Groundwater Protection Policy.* Given the characteristics of the Concept Plan and the fact that there is no shallow groundwater on the site, any effects on groundwater are considered minimal. Additional assessment of the detailed measures proposed for water quality and detention will occur at development application stage.

In respect to the following objectives of the NSW Groundwater Policy Framework. The following is offered:

- ***Slow and halt, or reverse any degradation of groundwater resources;***
  All runoff from the site will run through water quality control devises before being released to the natural drainage systems. Much of this will infiltrate back into groundwater systems. This will be an improvement on the current Aerodrome land use which has little water quality control.

- ***Ensure long term sustainability of the systems ecological support characteristics;***
  The development will not interfere with groundwater aquifers due to there depth and maintenance of water quality control structures ensuring long term sustainability.

- ***Maintain the full range of beneficial uses of these resources;***
  There are no perceived negative impacts to ground water that could effect uses at this time.

- ***Maximise economic benefit to the Region, State and Nation.***

While local economic use of the groundwater asset is currently limited, it is again considered that the protection of the resource afforded by the development will protect the resource for economic benefit in the future if it is required for such.

Development of the site will disturb at most the top 2 meters of soil in specific areas. The majority of the site did not record groundwater. The only area where is was recorded is the north west at a depth of 6 meters. This area is low and not proposed to be developed. It will remain as conservation. In addition stormwater quality devices will ensure runoff into natural water ways will be of an acceptable standard so to sustainably replenish groundwater systems.

7.5.9 Geotechnical Conclusions & Recommendations

From the site specific assessment undertaken to document the geological conditions of the site, it can be concluded that the site is suitable for the proposed development. No geotechnical constraints adversely affect the site as a whole and the concept plan is responsive to any limitations. Those areas with contamination issues can be suitably addressed by future specific reporting to determine the extent of the constraint and mitigation methods at DA stage.

7.6 Bushfire Risk Assessment

Given the site's location in close proximity to large areas of vegetation, the site has been identified as being bushfire prone. The proximity of bushfire prone land in and around the subject site is shown on ***Figure 12.*** In order to demonstrated the ability of the site to accommodate future urban development (in particular residential development) as assessment of the bushfire threat must be made and appropriate protective measure put in place.

The basis for a bushfire threat assessment is outlined in the Rural Fire Services (RFS) document, *Planning for Bushfire Protection 2006*. This document requires an assessment of the subject site in relation to the topography of the site and the type of vegetation, and how these combined will affect local fire behaviour. The predicted fire behaviour / intensity are then used to determine appropriate setbacks, known as Asset Protection Zones or APZ's.

An assessment of the site in line with *Planning for Bushfire Protection,* is attached ***Appendix H***. This report provides a full assessment of the site in relation to bushfire and bushfire mitigation, including recommended Asset Protection Zones. A summary of the recommendations of this report is provided below.

The outcomes of the assessment have been incorporated in the concept plan, in particular the provision of private roads and setbacks. The recommendations incorporated into the concept plan include:

As well as providing adequate asset protection zones between potential bushfire threats and dwellings, a number of additional recommendations have been made to ensure adequate bushfire protection measure have been provided.

- Access design needs to meet the requirements of the RFS as outlined in *Planning for Bushfire Protection 2006.*
- A designated water supply for fire fighting needs to be provided and must comply with Australian Standard 2419.1 for fire hydrant provision. Where hydrant systems cannot be provided to the service, all areas specific firefighting water supplies must be provided in line with the RFS criteria.
- Reticulated or bottled gas shall be installed and maintained in accordance with AS/NZS 1596-2002: *Storage and Handling of LP Gas* and the requirements of the relevant authorities.
- Where possible electricity lines are to be placed underground to prevent damage to infrastructure or loss of service during a fire event, and additionally to prevent the danger associated with damaged or exposed lines.
- Ongoing maintenance of vegetation with particular emphasis on Asset Protection Zones is required to ensure appropriate setbacks are maintained
    - If any trees are to be located within the envisaged APZs, this is considered acceptable, providing the following conditions are met:
    - Vegetation is not to touch or overhang dwellings;
    - Vegetation is well spread out and does not form a continuous canopy (separated by a minimum of 2 metres), especially within the IPA;
    - Vegetation is not a species that retains dead material or deposits excessive quantities of ground fuel in a short period or in a danger period; and
    - Vegetation is located far enough away from dwellings so that it will not ignite the dwelling by direct flame contact or radiant heat emission (minimum of 5 metres).
- The implementation of appropriate Asset Protection Zones as specified within Table 3.1 of that report;
- Woodpiles, combustible material storage sheds, large areas/quantities of garden mulch and stacked flammable building materials should not be located within IPA of dwellings;
- All public roads proposed within the development should be designed in accordance with the criteria of the RFS and Councils engineering standards;

It is considered that if the above recommendations are incorporated into the site and its ongoing maintenance then an acceptable level of bushfire risk can be attained for the proposal.

7.6.1 APZ Ownership & Management

All Asset Protection Zones are to be fully located within the boundaries of the concept plan area. For residential areas APZ's are to be fully contained within the boundaries of respective residential lots or road reserves. The maintenance of the APZ's within residential lots is the responsibility of the individual landowners. The use of a road as an APZ ensures its continued maintenance. Specific APZ size and maintenance requirements will receive further review when individual Development Applications are submitted to Lake Macquarie Council.

7.6.2 Bushfire Conclusions & Recommendations

Adequate protection can be provided in the concept design to enable the development to proceed in the manner proposed in the concept plan and in accordance with Planning for Bushfire Protection 2006, subject to the adoption of the above recommendations. Refer ***Figure 24*** – Bushfire Plan.

7.7 Infrastructure & Utilities

New infrastructure and, where appropriate, the augmentation of existing infrastructure will enable the proposal for North Cooranbong to be adequately serviced for water, sewerage treatment and re-use, energy and telecommunications in accordance with the requirements of the service agencies.

7.7.1 Water Supply

In June 2006, *Patterson Britton and Partners Pty Ltd* produced the North Cooranbong Bulk Water and Wastewater Servicing Study, refer ***Appendix I***. This study was prepared to examine feasible options for servicing the proposed development with bulk water supply and wastewater transportation infrastructure. All proposed bulk servicing options investigated in this study involve the connection of the proposed development to the existing Hunter Water Corporation water supply network and wastewater transportation systems and as such there have been ongoing discussions with Hunter Water Corporation.

Hunter Water Corporation has recently commissioned a Water Supply Servicing Master-Plan for the Morisset area. This strategy includes some consideration of the proposed North Cooranbong development. However, the development is only considered with regard to the ultimate (*post 2028*) development scenario within the supply system. Hunter Water Corporation has advised that the subject site can be serviced by the provision of either a high level supply tank, or an on-site reservoir to service the expected water demands from the proposed development. It has also been indicated that the connection to the existing supply system should be made at either the Dora Creek Reservoir or the junction of two Nominal Diameter, 375mm Cast Iron- Cement Lined water mains near the Dora Creek Bridge.

Water Demand

Hunter Water Corporation requested that the bulk servicing options formulated in the *Paterson Britton* Study included consideration of the neighbouring additional land areas, which is zoned for urban investigation and may have the potential for further development.

Ultimately the proposed development and the adjoining land areas are expected to produce an estimated average daily demand for water of 1800kL/day, with a peak hourly flow of approximately 100L/s.

Note: APZ's shown on ***Figure 24*** are indicative only and not to scale. No APZ's will encroach into conservation areas.

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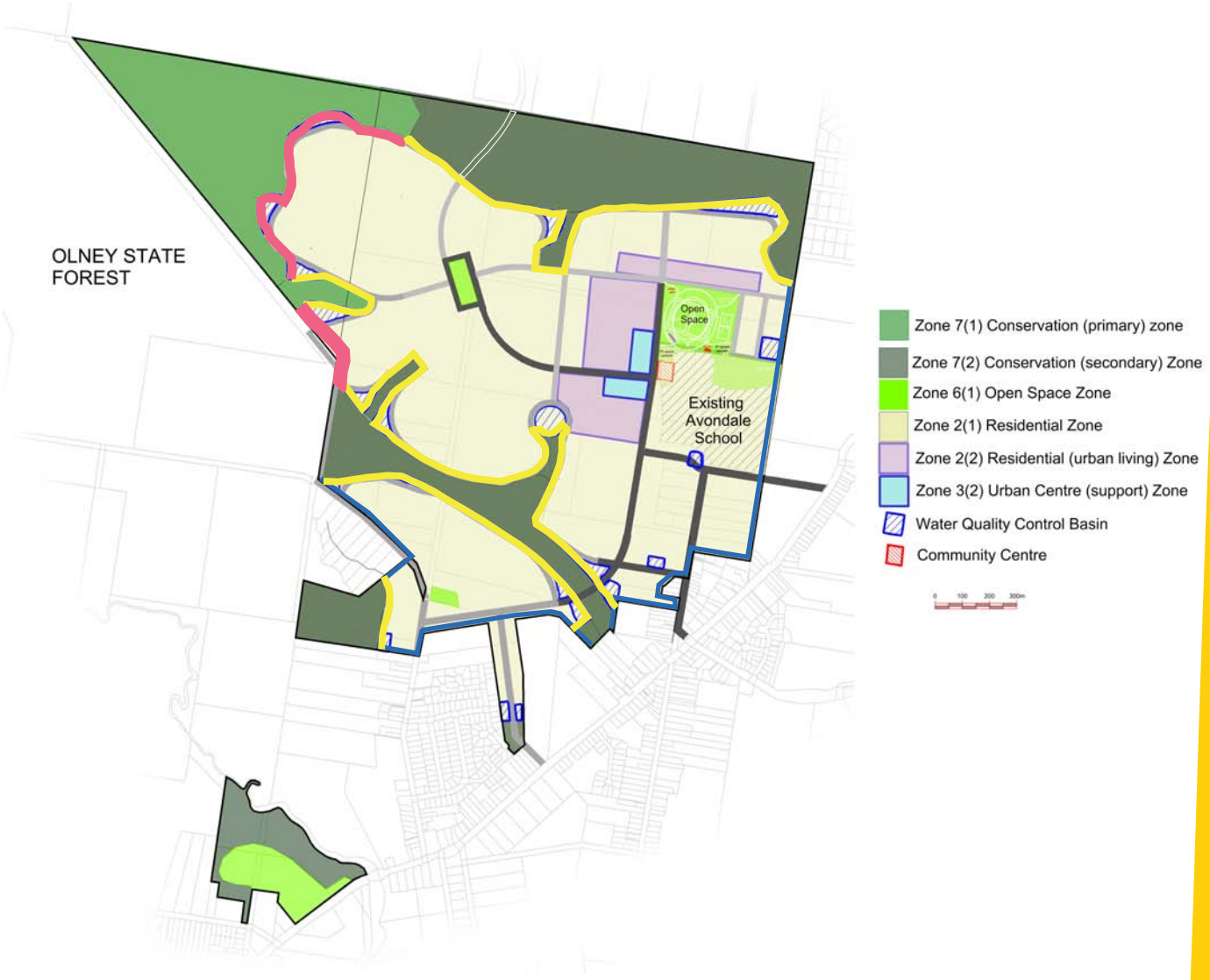


Not to Scale

ASSET PROTECTION ZONES

FIGURE 24

APZ Calculation

APZ's calculated on specific combination and slope effecting each subdivision boundary where residential land adjoins vegetation.

NOTE: APZ buffers shown are diagrammatic and are taken from the boundaries of conservation zones.

20 m APZ
15 m APZ
10 m APZ

HDB TownPlanning&Design

Water Supply Trunk Servicing Options

Modelling has indicated that the local reticulation system surrounding the proposal is at capacity and unable to service any additional lots. However, the existing Hunter Water Corporation's bulk supply mains and reservoirs is currently able to supply a maximum of 600 ET from the nominated Hunter Water Corporation connection points. The capacity of the system to allow for further development past this limit will be dependent on the nature and timing of works proposed in Hunter Water Corproation's adopted upgrade strategy.

It is recommended that the initial 600ET of the proposed development be serviced via a staged construction of a DN 300mm DICL pipeline. The first stage would involve the construction of the trunk main from the development to the Dora Creek Reservoir, which would allow for the initial 365 ET from the development to be serviced. Development up to 600ET could be provided through the extension of this water main from the Dora Creek Reservoir to the junction of the dual DN 375mm water mains at the Dora Creek Bridge. One pipeline route to the two connection points has been analysed, as this route represents the obvious feasible option for connection.

Several on-site servicing options (on-site reservoirs and high level systems) which would connect to the proposed DN 300mm trunk mains are available. All of these options have the capacity to service the water supply demands from the ultimate development of the site.

7.7.2 Wastewater & Water Recycling

Hunter Water Corporation is also currently undertaking a capacity review of the Dora Creek Wastewater Treatment Works (WWTW) to determine required augmentation works to cater for the expected growth within its catchment area. The design phase of the WWTW was due to commence in 2005, with the additional capacity (*sufficient for the proposed development*) likely to become available in 2008/2009.

In the short term, Hunter Water Corporation has advised that the existing spare capacity of the WWTW (*approximately 200 ETs*) may cater for the initial stages of the development. However, this capacity will erode with time due to other smaller developments within the catchment area of the WWTW. Hunter Water Corporation has also indicated that future upgrades to the Dora Creek WWTW will be funded by Developer Servicing Charges and will be managed by Hunter Water Corporation.

Sewer loads

Hunter Water Corporation requested that in relation to wastewater, the *Paterson Britton* Study also consider neighbouring additional land areas that may have the

potential for further development. Estimated wastewater loads will average 25L/s in dry weather and peak at approximately 200L/s in wet weather.

Wastewater Truck Servicing Options

Wastewater transportation options are limited to two possible alternatives, the construction of a new WWPS and rising main to connect the subject site directly to the Dora Creek WWTW (*Option S1*), or a connection to the Cooranbong No. 7 WasteWater Pumping Station (WWPS) with significant downstream upgrade works (*Option S2*).

Hunter Water Corporation has indicated that the development may be able to utilise the current spare capacity (*approximately 120 ET*) of the Cooranbong No. 7 WWPS during the initial stages of the construction without the need for upgrades. A cursory examination of Option S2 suggest that the significantly greater costs likely to be associated with the downstream upgrade works, required for connection to the Cooranbong No. 7 WWPS (*Option S2*), leaves the construction of a new on-site transfer WWPS and rising main (*Option S1*) as the most attractive option.

Option S1 would most likely be constructed along the same route as the proposed trunk water supply pipeline, which would bring cost benefits during the construction of the water and a wastewater pipeline sections, built simultaneously.

Water Recycling

The NSW State Government has legislated that all new residential dwellings shall receive a 40% reduction in potable water use when compared to traditional households. In June 2004, *Patterson Britton and Partners* produced the North Cooranbong Residential Development Water Management Principles, refer ***Appendix J***. This document addresses and provides advice in relation to the implementation of a water-sensitive urban design approach in order to contribute to the long term sustainability of the site and its surrounding environment.

To achieve these targets Johnson Property Group propose a number of water saving measures to be incorporated into various stages of the development, including the adoption of water saving devices, rainwater re-use and the use of recycled water across the site to achieve a minimum 40 % reduction. Recycled water could be used for watering playing fields, topping up artificial water features and other forms of irrigation.

Importantly an agreement between JPG and Hunter Water Corporation was signed in mid 2007 outlining JPG's commitment to introduce a 'third pipe' into the subdivision design to allow circulation of treated recycled water for reuse in landscaping irrigation and toilet flushing. The 'third pipe' system will provide a second water meter to dwellings which connects homes to the recycled water

system. Although exact figures are not yet available, the use of recycled water will result in large reductions in the use of potable water within the proposed community.

7.7.3 Electricity

Correspondence was received from *Energy Australia* dated 24th September, 2004 (***Appendix D***) which notes that there is sufficient supply for the North Cooranbong proposal. There is three phase high voltage 11kv supply available in Freeman's Drive, Alton Road and Avondale Road Cooranbong, which surrounds the subject site.

7.7.4 Communications

The site is located in close proximity to the existing village of Cooranbong and it is considered that the site will have access to a suitable telecommunications network.

7.7.5 Natural Gas

Correspondence was received from Agility Energy dated 7th September, 2004 (***Appendix D***) which notes that natural gas is available in the vicinity and can be extended to supply the North Cooranbong proposal.

7.7.6 Infrastructure Conclusions & Recommendations

From the investigations undertaken, it is considered that with the provision of appropriate infrastructure at the developer's cost, the project can be adequately serviced without adversely impacting on surrounding facilities and the level of service already existing in the area.

Development of this area will have a positive impact in that the level of services are likely to increase with an expanded population.

7.8 Heritage

In January 2005, an assessment of the European heritage and archaeology within the site was undertaken by *Graham Brooks and Associates Pty Ltd*. This report is attached as ***Appendix K.*** *Myall Coast Archaeological Services* prepared an Archaeological Survey and Constraints Study of the subject site in July 2003. This report is attached as ***Appendix L***.

7.8.1 Indigenous

Myall Coast Archaeological Services prepared an Archaeological Survey and Constraints Study of the subject site in July 2003. This report is attached as ***Appendix L***. Although this report was completed to meet the planning requirements of a previous rezoning application, its contents are still relevant to the

concept plan as outlined in a letter from the archaeological consultant also attached in ***Appendix L.***

Urban development of the land is not affected by matters of Aboriginal archaeological significance. The Koompahtoo Local Aboriginal Land Council has been consulted and the report notes the following:

- Potential archaeological sites within the subject land include isolated finds and open campsites;
- It is not likely that burial sites or ceremonial features will be found;
- Trees are either too recent or of inappropriate type for scare trees;
- There is no exposed rock on the site and the possibility of the area containing axe-grinding grooves is negligible. Accordingly, the possibility of art work is non-existent;
- The site was probably used in the past as an occasional food source and for fostering animal life; and
- The presence of wetlands/drainage areas also implies a likely Aboriginal occupation, but given the close proximity of a greater food/water source to the east, this site was possibly a less frequented source.

While it is probable that Aboriginals utilised the resources of the study area, it is unlikely that their activities would have left much lasting evidence of their visit than perhaps the odd isolated artefact, particularly as there has been significant disturbance to the top soil. Archaeological evidence was not discovered through the field study. However, undetected sites and artefacts may remain in the study area as subsurface artefacts.

The report also concludes that that there is no significance of the site with regard to social, historic, scientific or aesthetic values.

Although it is highly probable that no artefactual material will be found, even if present, it is important, in order to demonstrate due diligence, that preliminary earthworks are carefully observed to ensure that if objects are unearthed, that any opportunity there may be to add to the archaeological record is not accidentally destroyed.

Recommendation

The following recommendations are made in consultation with the Local Aboriginal Land Council and under the legal requirements of the NPW Act 1974:

- The Myall Coast report has identified an area along the creek line and to the west of the chicken sheds at the extreme southern boundary of

the site as an area that may require further assessment, should this specific area be considered for future development. This area is however proposed to be Environmental, and as such there will be no development in this area;

- There is no impact on Aboriginal Places or Objects or Potential Aboriginal Deposits and there is no impediment to the proposed development for Aboriginal Cultural reasons;
- The development is not an integrated development and referral to NPWS is not required and neither is a permit under Section 90 of the NPW Act for the development to proceed; and
- That the proponent inform all workers to be diligent when undertaking land preparation and if however, in the process of land preparation, artefacts are found, then work must cease and the LALC and NPWS be informed. To remove or destroy artefacts without a permit is an offence under Section 90 of the NPW Act, 1974.

7.8.2 European

In January 2005, an assessment of the European heritage and archaeology within the site was undertaken by *Graham Brooks and Associates Pty Ltd*. This report is attached as ***Appendix K.*** This report focuses specifically on the Cooranbong Aerodrome, located on Avondale Road.

"Cooranbong" is from the Aboriginal word meaning rocky bottom creek or water over rocks. The name was officially adopted with the opening of the Cooranbong Post office in 1866. The early land grant for the area was 2,000 acres, in 1826 and was mostly left under the care of an overseer. A second adjoining grant was finally issued in 1837. In 1861, seven lots ranging from 10 – 272 acres, mostly adjoining the western boundary of the early grant were sold and later became the area of the village centre. At this time families moved into the area and settlement slowly began.

Cattle and dairy farms were operating prior to settlement and from the 1860's timber products were exported. The timber market slowed in the 1890's with the end of the railway contracts and the national economic depression. Fishing and shipbuilding were other early industries. Cooranbong was bypassed by the Waratah to Homebush railway. This adversely affected the town's development, as Cooranbong began to rely on Morisset to fulfil transport needs.

In 1885 the Australian Seventh Day Adventist community was sparked with the coming of seven missionaries from USA, lead by Clarence White, with the desire to establish a missionary training centre. The desirable attributes for a permanent site included a rural setting enabling a balanced program of mental, physical and spiritual development that was otherwise too distracting in a city environment. The

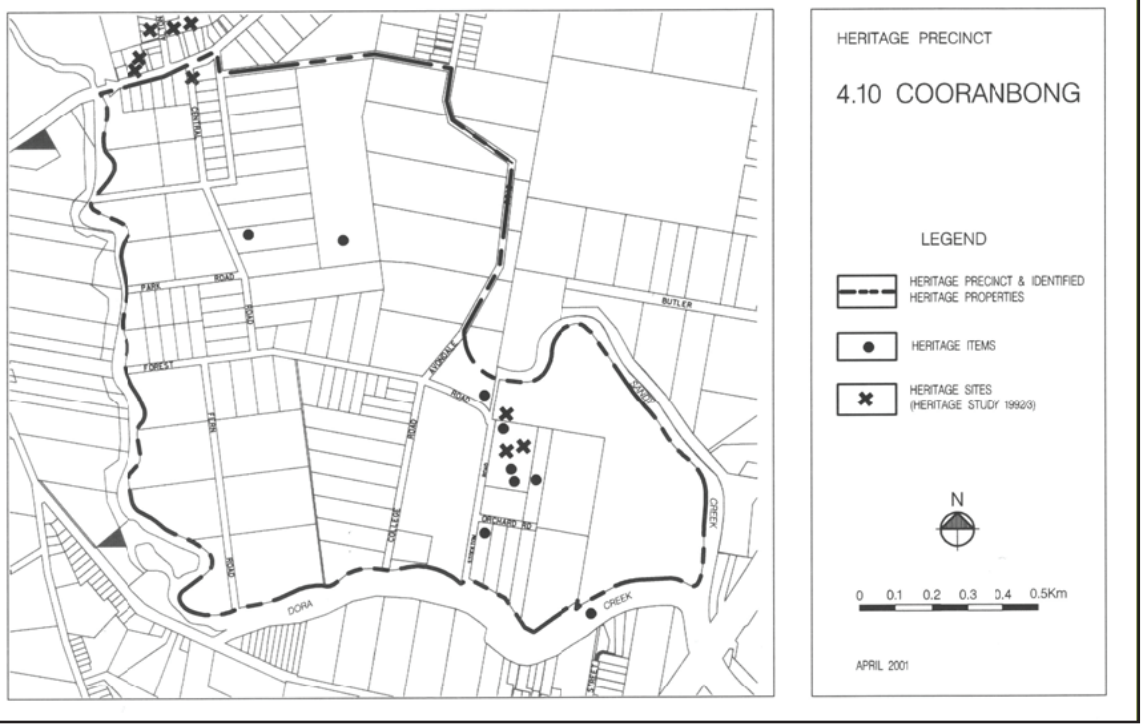
school came to be the Avondale School for Christian Workers at Cooranbong, NSW. Its name changed to Australasian Missionary College in 1911 and again to Avondale School in 1964.

Clarence White reasoned that parents would like to be near their children when they studies and planned an Adventist community around the school. The selling of real estate property to do this would mean income for the college. In ensuing years the college increased its lands to the south and the richer soils and borders of the creeks and the total area to 1600 acres. The Seventh Day Adventist School and associated community was established in Cooranbong and grew to become synonymous with the town. Refer ***Figure 25*** – Heritage Plan.

Conclusion

With specific regard to the Cooranbong Aerodrome, the *Graham Brooks* report details the history of the establishment of the facility and its significance to the community. The site does not contain heritage items and is not within a heritage conservation zone. The existing aerodrome is considered to have some social significance to the local community and the Seventh Day Adventists organisation. Accordingly there are opportunities for interpretation of the airstrips through the alignment of roads, naming of streets and appropriate, commemorative signage.

Map 1 – *Cooranbong Heritage Precinct*



March 1954 aerial photograph
(NSW Dept. of Lands)

April 1984 aerial photograph
(NSW Dept. of Lands)

HERITAGE PLAN

FIGURE 25

Sunnyside Adventist Museum, Avondale Road. Note: Andrew Stewart mounted to right of building.

Source:
Cooranbong Aerodrome,
Avondale Road, Cooranbong
GRAHAM BROOKS AND ASSOCIATES PTY LTD

7.9 Social Community Infrastructure

7.9.1 Community Needs

Key Insights Pty Ltd prepared a Social Impact Assessment (SIA) for the North Cooranbong project in February, 2005. A supplementary study to the original SIA was prepared in July 2006. These studies are attached as ***Appendix M.***

It is envisaged that the North Cooranbong concept plan will develop in stages over a twenty year period. Market forces will determine the pace of development and some flexibility will be required in relation to the actual timing of the provision of facilities. This is due to the fact that it is the population base and not the time period that determines the provision of infrastructure.

At completion, the North Cooranbong concept plan will provide a new residential community with an expected population of some 6,500 people. Significant investment input will be required for the social and community infrastructure essential to meet the needs of this new community. While it is recognised that some of these services are currently available directly within the Cooranbong community and surrounding areas such as Morisset and Dora Creek, it is considered that specific areas will require the provision of additional capacity to accommodate the needs of the new population.

The *Key Insights* report provides an analysis of the existing and future demographic trends, as well as an audit of the existing community facilities in the locality. Clearly this project represents a major land release in the locality in accordance with the Lower Hunter Regional Strategy. JPG is committed to providing contributions in accordance with an agreed VPA, towards the provision of this social infrastructure having regard to Council's existing requirements.

The outline of the VPA is addressed in Section 6.1.1.

7.9.2 Social and Community Infrastructure Conclusions & Recommendations

The *Key Insights* report concludes that Cooranbong, in conjunction with the commercial and community facilities associated with the project, as well as the resources of the wider Morisset Planning District, will have access to sufficient services and infrastructure to support this level of development. With careful attention to issues of community coherence and integration at the planning and development stages, it has the potential to contribute to the realisation of the objectives of the Lake Macquarie's 2020 Strategy and Social Plan as well as meeting the objectives of the Lower Hunter Regional Strategy.

Cooranbong is a unique community which is closely linked to the Avondale Adventist Church. The *Key Insight's* report recognises that the injection of a large new population group with markedly different social characteristics and histories will be the most significant social impact of the development for Cooranbong. This injection of diversity will offer many benefits to the local community, however, it is expected that the Seventh-day Adventist Church should maintain its significant role within the community.

It is recognised that the key component for the success of the development of this new community will be the timely provision of high standard social infrastructure. This will ensure that links will be developed between the established residential community and the new residents coming into the area. It will also reinforce the objective of maximising self containment within the community.

JPG is committed to providing contributions in accordance with an agreed VPA, towards the provision of this social infrastructure having regard to Council's existing requirements.

It is however important that given the long timeframe associated with the development of the area, all planned community infrastructure, as well as the provision of land area, retains an element of flexibility and that there is a need for all proposed community infrastructure to remain relevant to the changing demographic and social needs of the growing community.

7.10 Economic Development

7.10.1 Multiplier Effects

In July, 2006, an assessment of the economic and employment impacts of the proposal was prepared by *Hill PDA* (for URS, and on behalf of Lake Macquarie City Council). This report is attached as ***Appendix O***. The following information relating to the anticipated multiplier effects of the North Cooranbong proposal have been taken from the *Hill PDA* report.

Construction Phase

The construction industry is a significant component of the economy accounting for 6.6% of Gross Domestic Profit and employing almost 14% of the workforce at March 2003. The industry has strong linkages with other sectors, so its impacts on the economy go further than the direct contribution to construction. Multipliers refer to the level of additional economic activity generated by an industry source.

There are two types of multipliers:

- Production induced: which is made up of:

  - First round effect: which is all outputs and employment required to produce the inputs for construction; and
  - An industrial support effect which is the induced extra output and employment from all industries to support the production of the first round effect, and
- Consumption induced: which relates to the demand for additional goods and services due to increased spending by wage and salary earners across all industries arising from employment.

The source of the multipliers adopted in the *Hill PDA* report is ABS and Australian National Accounts: Input – Output Tables 1996 – 97 (ABS Catalogue 5209.0). These tables identify first round effects, industrial support effects and consumption induced multiplier effects at rates of $0.466, $0.438 and $0.962 respectively to every dollar of construction.

The *Hill PDA* report calculations are based on a total of 2500 lots and associated dwellings, with a construction cost of $671m. This construction cost has been then used to calculate a further $607m activity in production induced effects and $646m in consumption induced effects. Total economic activity generated is equivalent to $1,924m.

Employment Generated

With regard to employment generated from construction, the *Hill PDA* report estimates that one full time construction position for 12 months is created for every $148,827 of construction work undertaken. With an estimated construction cost of $655m, it is estimated that construction of the subject site will therefore generate 4,154 job years directly in construction over the project timeframe. This equates to 244 job years per annum.

The Hill PDA report also calculates the expected employment multipliers. The 1996 – 1997 Input – Output Tables identified employment multipliers for first round, industrial support and consumption induced effect of 0.33, 0.45 and 2.33 respectively for every job year in direct construction. These multipliers were adjusted to March 2004 using the building price index. For every $1m of construction cost, a total of 26 job years could be generated in the economy and the proposed development as a whole has the capacity to generate some 17,304 job years.

These multiplier effects are national and not necessarily local however, it is considered that these calculations illustrate the high flow-on effects of construction activity to the rest of the economy.

The *Hill PDA* report also investigates how the needs of the people living in the new community will generate employment. Resident generated employment refers to employment required to service the resident population in retail, education, personal and community services.

Based on the most recent ABS Retail Survey there was approximately 2m² of retail space per capita in 1998 – 99. The report assumes that 6,650 people will generate a demand for 13,300m² retail space. In addition to this, there are commercial space users that generally locate in shop front retail space, such as real estate agents, travel agents, banks etc.

Based on the ABS Retail Survey 1998 – 99, with regard to retail employment, an average of one employee per 21.5m² for anchor tenants and one employee per 30m² of specialty floor space would be generated. In addition to this, there will also be additional employment created off-site, but still within the Local Government Area, at a rate of 40m² per employee. These numbers can be confirmed once defined retail spaces have been deduced for the subject site.

In addition to the retail employment generated on site, jobs will also be created in Education and Community Services areas. Given the size of the subject site, it is most likely that employment generation in these areas will be off-site, but still within the Local Government Area. However, some proportion of this will escape to Newcastle and Sydney. The Hill PDA report estimates a requirement for some 206 persons to be employed within the vicinity of the site, with the majority of employment within the Morisset regional area. With regard to Health and Community Services, it is estimated that there will be a requirement for some 270 persons to be employed in this sector, with approximately 50% of the jobs located off-site, but within the Lake Macquarie Local Government Area (approximately 135 jobs) and the remaining 50% located on-site or outside of the Lake Macquarie Local Government Area.

7.10.2 Market Demand Analysis

In October 2006 the NSW Department of Planning released Lower Hunter Regional Strategy 2006 (LHRS). This strategy provides region wide direction to ensure the adequate provision of land for various uses over the next 25 years. This plan aims to sustainably provide for the predicted demand for residential and employment land over this period.

Residential capacity of the region forms a major component of the LHRS with provision for residential land to accommodate approximately 115,000 new dwelling houses for an estimated increase in population of 160,000 people.

Among future urban areas identified by the LHRS is the North Cooranbong area. Specifically the LHRS identifies the North Cooranbong future urban area as accommodating up to 3000 new dwellings. The proposal as outlined in the report, seeks the Minister's permission for 2500 lots for residential use. This represents approximately 2.2% of the proposed new residential lots/dwellings proposed under the strategy. This equates to approximately 3.9% of the anticipated population growth in the region. Importantly the site represents the major urban (residential) release in the Westlake's area with the ability to meet demand for residential land in the area highly dependent on the timely, efficient and sustainable release of this site.

Although the Social Impact Assessment undertaken by *Key Insights Pty Ltd* (attached as ***Appendix M***), was finalised prior to the adoption of the LHRS, it discussed the future market demand for residential housing in the Cooranbong area. The following summarises the key findings of the report.

Existing Housing Supply

The Cooranbong are has been largely quarantined from population pressures by its "collective" ownership and planning decisions have not related directly to demands placed on other areas. Cooranbong's housing supply is influenced by deliberate choices to accommodate older people within a unique community. Housing is also affected by the Avondale School and its planned residential form. It is therefore not surprising that the predominant housing type in North Cooranbong, Cooranbong and Morisset is singlet detached housing. North Cooranbong has more townhouses and villas, Cooranbong has a higher proportion of flats and Morisset dominates in terms of detached housing. These forms of housing however make up a very small proportion of the total housing type when compared to single detached housing.

Existing Household Structure

With regard to existing household structures, Cooranbong displays similar characteristics to those of Lake Macquarie LGA and NSW (based on BCP Table B 14, Census 2001). A majority of the residents are either a partner in a marriage, or a child under 15. Cooranbong's main departure from Lake Macquarie LGA is the proportion of child under 15 households, which is higher in Cooranbong, and in partner in de facto registered marriage, of which there are a fewer number in Cooranbong. This suggests that the "typical" household unit within Cooranbong is a married couple with children. This is true of most Australian domestic situations where 72% still live in family households.

Due to the older nature of Cooranbong's population, it is considered that there is a higher proportion of "empty nesters", couples whose children have grown up and moved out. The proportion of couple families without children is expected to increase across Australia over coming years as the population ages and fertility

rates fall. This will presumably increase the demand for alternatives to large, traditional family orientated housing.

The proportion of lone households in the Cooranbong area at the Census 2007 reflects the overall age of the population, somewhat lower than the figures for Lake Macquarie and NSW. While there are lone households of all ages, most are men aged 35 to 44, or men and women over 55.

Projected Populations

The initial SIA prepared by *Key Insights Pty Ltd* found that any development proposal for north of Cooranbong would be likely to accommodate residents markedly different from those who currently live in Cooranbong, with new housing on any scale likely to be taken up by a market closer to the city and state averages. This would mean a younger population, with a large proportion of couples with children under 15. Commuters to Sydney and first home buyers were also projected to be attracted to the development.

Further to this, Section 5.7 of the supplementary information prepared by *Key Insights* has undertaken some aged-focus population profiling in relation to potential makeup of the anticipated community. This is outlined in the table below.

Table 15 – Potential Community Demographic.

Age Bracket	Percentage Estimate	Projected yield @ 6,500 residents
0 – 19	35%	2275
20 – 59	55%	3575
60+	10%	650

The *Key Insights* report also pointed to the fact that the type of family in which people live has an impact on household size and therefore the demand for accommodation. The population projections suggest the likelihood of an incoming community comprising large numbers of children (and their parents) and a low number of retirees or those approaching retirement.

In terms of optimum population, this may appear skewed towards young families. However, in the context of the wider, older demographic (and the potential co-current development of additional Cooranbong aged housing), a high proportion of young families will aid optimum diversity in the larger community mix. Diversity is also desirable in terms of income levels, family styles, cultural backgrounds and lifestyles.

Housing Targets

The North Cooranbong development proposal provides the opportunity to expand and diversify housing options in an area traditionally dominated by large rural

residential housing. The provision of mixed housing stock also caters for all stages of the lifecycle and will help build Cooranbong as a diverse, multigenerational and increasingly self-sustaining community.

The Key Insights report suggests the following housing targets:

Table 16 – Housing Targets

Housing Need	Proportion of Housing Stock
Detached dwellings	80%
Attached / multi-unit	20%
Adaptable	10% of above
Lower cost housing scheme	10% of above
Rental	10% of above

Existing Residential Market

The Economic Impact Assessment prepared by *Hill PDA* (***Appendix O***), states that whilst numerous residential lots are currently for sale and whilst projects in the pipeline may be released onto the market at the same time, it is desirable to have multiple fronts. This results in multiple developments being on the market at one time, illustrating differences in affordability and product range.

Research by Hill PDA, has indicated that Lake Macquarie is growing at a rate of 900 dwellings per annum. From this data it has been established that there is need for more residential dwellings in the immediate area as currently only 16.7% of new residential dwellings coming from the catchment area of Morisset, Dora Creek, Toronto, Cooranbong and Bonnells Bay,

The *Hills PDA* report shows a relatively strong correlation between house price movements in the suburb of Cooranbong and the wider Lake Macquarie LGA over the past 10 years and illustrates strong growth from 2001 to 2004 when the median price increased from approximately $150,000 to $320,000. This however, dropped off to around $275,000 as the residential market generally declined across most regional and metropolitan markets.

Residential Take-Up Rates

In respect to residential take up rates, the Hill PDA report suggests that the current sluggish residential lot sales rate will need to increase in the medium to longer term in order to maintain the viability of the larger estates. The ultimate sales rate will depend on the timing of the residential land releases. Sales rates are slow at present, with many estate and land releases indicating negligible or very few sales per month. This is forecast to continue into the immediate future.

However, at some point a recovery is likely to improve these rates more in tune with the longer term averages. This is likely to be attributed to current supply being met, as well as other areas like Bonnells Bay and Dora Creek being built out, with no new and available land capable of residential subdivision.

At this point, it is likely that take-up rates for the subject site at North Cooranbong will increase as a result, and maintain higher sales into the future until such point as the site is fully sold. The research indicates that rates for residential estates are in the order of 30 – 50 lots per annum.

Recommendation
It is suggested that 50 – 200 lots be released per annum over the life of the project, dependent on demand levels and the rate of absorption of lots. Lots should cover a wide market sector and include smaller lots.

7.10.3 Housing Affordability

The SIA prepared by *Key Insights Pty Ltd* investigated the need for diverse, affordable and adaptable housing. The positive link between diversity of housing options with diversity and sustainability within the local population is a theme that informs the SIA, as well as contemporary community development research and strategies. The intention is to provide mixed housing underscores major planning documents such as the Lower Hunter Regional Strategy and much of Australian urban planning.

A diverse population is one that includes a range of residents (and workers) from across a range of ages, cultural backgrounds, belief systems, income levels and family structures. Supply side strategies with positive implications for diversity included within the North Cooranbong proposal include:

- Provision of a range of lot sizes and housing styles;
- Development of a private housing market entry scheme to increase access for eligible purchasers; and
- Provision of adaptable and universal housing to cater to people with a disability and those who choose to “age in place”.

7.11 Principles of Ecologically Sustainable Development and Greenhouse Gas Emissions

The sustainability of the proposal will require a number of areas to be considered and an assessment of each with a view to setting achievable targets with which to improve the sustainability of the proposal. In particular, areas which need to be assessed in relation to sustainability include:

- Energy

- Water
- Materials and waste
- Transportation
- Biodiversity
- Emissions, and
- Social impact

The 1987 World Commission on Environment and Development report produced what is known as the 'Brundtland Report' in which the principle definition of sustainable development was given.

> ***"Sustainable development meets the needs of the present without compromising the ability of future generations to meet their own needs."***

This definition sets the basis for sustainable development today. A primary indicator of the sustainability of a project, in addition to an examination of those items listed above, is an assessment of the Carbon Dioxide (CO_2) emissions. As such these also need to be addressed by this report.

Before providing an analysis of the sustainability of the proposal an initial breakdown of the proposed land uses is required to determine possible rates of energy and recourse use, and therefore greenhouse gas production (both direct and indirect) and therefore sustainability.

7.11.1 Predicted Carbon Dioxide Emissions & Global Warming

Using the known characteristics of the proposed urban design an assessment of the estimated CO_2 emissions can be made. Emissions for a development such as that proposed, can be derived from the expected size of the development as demonstrated in **Table 16.**

Table 17 – Predicted $C0_2$ emissions over 50year period

Component	Amount	Predicted Emission
• Number of Dwellings • Average Dwelling Size 215m² • Average household energy use	• 2500 • 215m • 8 tonnes	Emissions are calculated at a rate of 8t CO2/m2/year. Therefore estimated emissions equal **Annual** 2500x215x8 = 43 00 000 **50 year Period** 43 00 000 x 50 = 215 000 000
Total Estimated CO_2 Emissions		Total estimated CO_2 emissions over a 50 year period equates to 215 000 000t

Table 17 provides an indicative quantity of CO_2 emissions for the residential component of the future suburb over a 50 year lifetime.

The following table, **Table 18**, illustrates the greenhouse gas emissions the commercial, town centre area of the North Cooranbong concept plan.

Table 18 – Estimated Carbon Dioxide Emissions from Commercial / Retail/Mixed Use Space i.e. Town Centre

Mode of Generation	Rate Of Calculation	Estimated CO_2 Emissions
Energy and greenhouse gases embodied in construction materials	Moderate - approx 0.5 to 2 tonnes CO_2 /$m^2$of construction (with high rise office buildings towards the upper end). Over a 50 year building life, this equates to 0.01 to 0.05 tonnes CO_2/m^2 per year	1.25t / m² 1.25 X 2500m² = 3125 tonnes
On-site construction energy	Low. Although some energy-intensive practices occur, they occur over a short time compared with building life. Equates to about 10% of embodied energy. Construction energy use is about 0.3% of Australian energy-related greenhouse gases.	10% X 3125 t = 312.5 t
Operational energy	Moderate to large - 0.1 to 0.9 tonnes CO_2/m^2 per year. Average office building 0.3 tonnes CO_2/m^2 (of which 20-70% is space HVAC) - see below.	0.3t CO_2 /m2 / yr= 750t/ yr Over 50yr's 750 x 50 = 37500 tonnes CO_2.
Total $C0_2$ Emissions associated with non-residential part of site		40,937.5 tonnes CO_2

These figures give a general indication of the potential CO_2 emissions from the concept. More specific emission data can be calculated when exact figures are known.

Sea Level Change

The primary direct effect of a rise is average global temperatures resulting from increases in greenhouse gases, (apart from climatic abnormalities) is a predicted rise in mean sea levels. Much uncertainty exists around what the effects on the mean sea levels of the world will be due to climate change. While a number of models exist and a number of predictions have been made the Findings of the Intergovernmental Panel on Climate Change (IPCC) are generally accepted to be the most accurate scientific based predictions currently available. The significance of the IPCC's work has recently been reinforced by the awarding of the Nobel

Peace Price to the Panel and its public face Al Gore. While the significance of the potential effects of a rise in sea level are widely accepted the ability to accurately predict changes is even disputed within the IPCC.

The IPCC, in its most recent publication, indicate that over the previous decade sea levels *may* rise by approximately 3mm per year. In order to demonstrate the capacity of the subject site to accommodate the proposed development in the long term, its susceptibility to the effects of climate change and in particular rising sea levels are required. Using the above figure for annual sea level rise as a guide, and noting that the lowest point within the subject site sites is RL 10m, would mean the subject site has several hundred years before rising sea levels effect its lowest points, remembering the majority of the site sits on higher ground.

Despite the number of assumptions that surround the rising sea level predictions and the uncertainty surrounding the effects of climate change, it can be generally considered that the subject site will not be adversely affected by rising sea levels during the foreseeable long term. The effect beyond several hundred years cannot be reasonably assessed as part of this document due to the aforementioned uncertainty surrounding climate change predictions.

7.11.2 Sustainability Targets

Given that the proposed urban development of the North Cooranbong site is currently at a concept stage, specific figures in relation to environmental impact cannot yet be finalised. Despite this, it is important to provide guiding sustainability targets which will form a basis of the future development of the site. Specifically for each of the following areas the suggested aims should be used to set and achieve future targets with a view to ensuring the environmental sustainability of the proposal.

Energy

While energy targets and aims are closely related to greenhouse gasses (as will be fully discussed in the following section) the following aims are given in relation to the proposed urban development:

- All dwellings to meet or exceed NSW Governments BASIX requirements for dwellings;
- All dwellings to be installed with solar or solar assist hot water systems; and
- An as yet to be determined percentage of the sites entire energy use is to be sourced from renewable generation methods.

Water

- All dwellings to meet or exceed NSW Governments BASIX requirements for dwellings;

- Water sensitive design to be incorporated into urban development. Best practice standards to be used;
- Non-potable water to be used for landscaping and toilet flushing, via connection to the recycled water system; and
- Such use of non-potable/recycled water to meet Government health requirements.

The ability to provide connection to a recycled water reticulation systems is a major aim of the concept plan. A partnership between JPG (the proponent) and HWC, will provide recycled water via a third pipe the future dwellings ultimately reducing the total volume of water used on the site. An agreement has been signed by both of the parties with specific design details yet to be finalised.

Materials and waste

- Where possible, materials to be sourced from certified green providers;
- Reuse and recycling on site to be maximised to reduce waste going to landfill and the need for new materials (and the additional inherent energy they contain); and
- Residential disposal of compostable waste will be encouraged to reduce total waste going to landfill.

Transportation

- Urban design to maximise the walkability and cycling opportunities for residents and reduce reliance on the motor vehicle.
    - Achieve walkability connections to public transport opportunities; and
    - Achieve walkability to local services and facilities.
- Provide additional public transport opportunities for future residents.

Biodiversity

- To improve the future urban environment through landscaping with locally sourced native plant species
    - Drought tolerant species to be provided to reduce demands on water
- To protect and enhance those aspects of the site's unique biodiversity; and
- Dedication of sensitive habitat areas to offset the effects of the proposal.

Emissions, and

- To reduce all possible emission to land, air and water as a result of future development.

Social Impact

- The incorporation of crime prevention through urban design (for example improving passive surveillance); and

- The provision of affordable housing within the future urban footprint.

7.11.3 Principles of Ecologically Sustainable Development and Greenhouse Gas Emissions Conclusions & Recommendations

The aims given in the preceding sections in relation to sustainable development and climate change have been made to provide guidance for the future development of the North Cooranbong precinct. As the proposal is currently at the planning stage specific quantitative targets cannot be realistically made at this point in time.

In order to build on these initial objectives, a sustainability strategy can be formulated prior to any development being undertaken to provide specific aims and objectives and to ensure that sustainability principles are incorporated into the new suburb. It is considered that if the objectives outlined in this document are used as a basis for the ongoing sustainable development of North Cooranbong then the suburb's development will be undertaken in a fully sustainable manner.

7.12 Visual Impact Assessment

Given the scope of the concept plan, adequate consideration of the visual effects of the proposal need to be taken into consideration. The site's characteristics and the visual impacts of the concept plan, on surrounding land uses can demonstrate that the proposal will have minimal visual impact on the locality.

The subject site is located on relatively flat land to the north of the existing urban area of Cooranbong. The lack of extreme topographical features on and around the site was a major reason the site was formally used as an aerodrome. As a result of this topography the site has no areas of high or extreme visual importance as no major view corridors traverse the site.

The proposed concept plan will see a reduction in the total amount of site vegetation however significant areas of vegetation will be maintained, particularly along water courses. Importantly, the highest part of the site in the northwestern corner has been designed to be a road junction area centered on a small open space. This will have the effect of preventing any building or development on this part of the site which could potentially impact on the visual amenity of the locality.

The major transport corridor in relation to the subject site is the F3 (Newcastle – Sydney) Freeway. The Freeway runs in a north – south manner, some 800m – 1km to the east of the site. The F3 generally runs in an undulating manner and in the locality is predominantly at the same level or slightly lower in height when

compared to the subject site. The combination of vegetation, topography and distance from the site prevents any major visibility of the subject site from the F3.

In addition to the visual impact to the Freeway additional visual corridors where assessed for the visual effects of the proposal. It was concluded that, as mentioned above, the lack of topographical features in close proximity to the subject site limits possible visual intrusion caused by the concept plan. Where visibility can occur it is usually at some distance, limiting any negative effects of the proposal.

The following recommendations have been used to reduce the overall visual impact of the proposal:

- Retain, where possible, vegetated links through and around the site to prevent broadscale clearing, create views framed by vegetation and improve a sense of community for future residents;
- Locate higher densities in areas of low visual importance;
- Restrict development size and materials to prevent construction of visually intrusive development. This includes limiting the use of non-natural and/or bright colours;
- Use low spillage street lighting to reduce the visual impact during non-daylight hours; and
- Locate services underground where possible.

The concept design has been prepared to provide an urban design which best suites the environmental features of the site. Given the relative flatness of the site and surrounding land coupled with those mitigating features listed above, the concept plan will have minimal impact on the visual amenity of the surrounding suburb.

7.13 Noise Impact Assessment – F3 Freeway

As part of the preliminary impact assessment for the concept plan ***Reverb Acoustic Pty Ltd*** was engaged to assess the potential noise impacts of the F3 Freeway on the residential areas of the concept plan. The noise study was undertaken to assess noise values for the residential areas in line with the requirements of the RTA, DECC and LMCC. The Noise Impact Assessment is attached as ***Appendix N.***

To determine noise levels for the subject site an environmental noise logger was placed on the subject site at a location closest to the F3 Freeway so the results would show maximum noise levels for the entire site. Noise levels were continuously monitored for a period of seven days, from 14th December to 21st December 2007.

The noise level criteria for the proposed residential area was taken from the DECC's Environmental Criteria for Road Traffic Noise (ECRTN) and is shown in **Table 19**.

Table 19 – Extract from Table 1 of ECRTN Relevant Traffic Noise Criteria

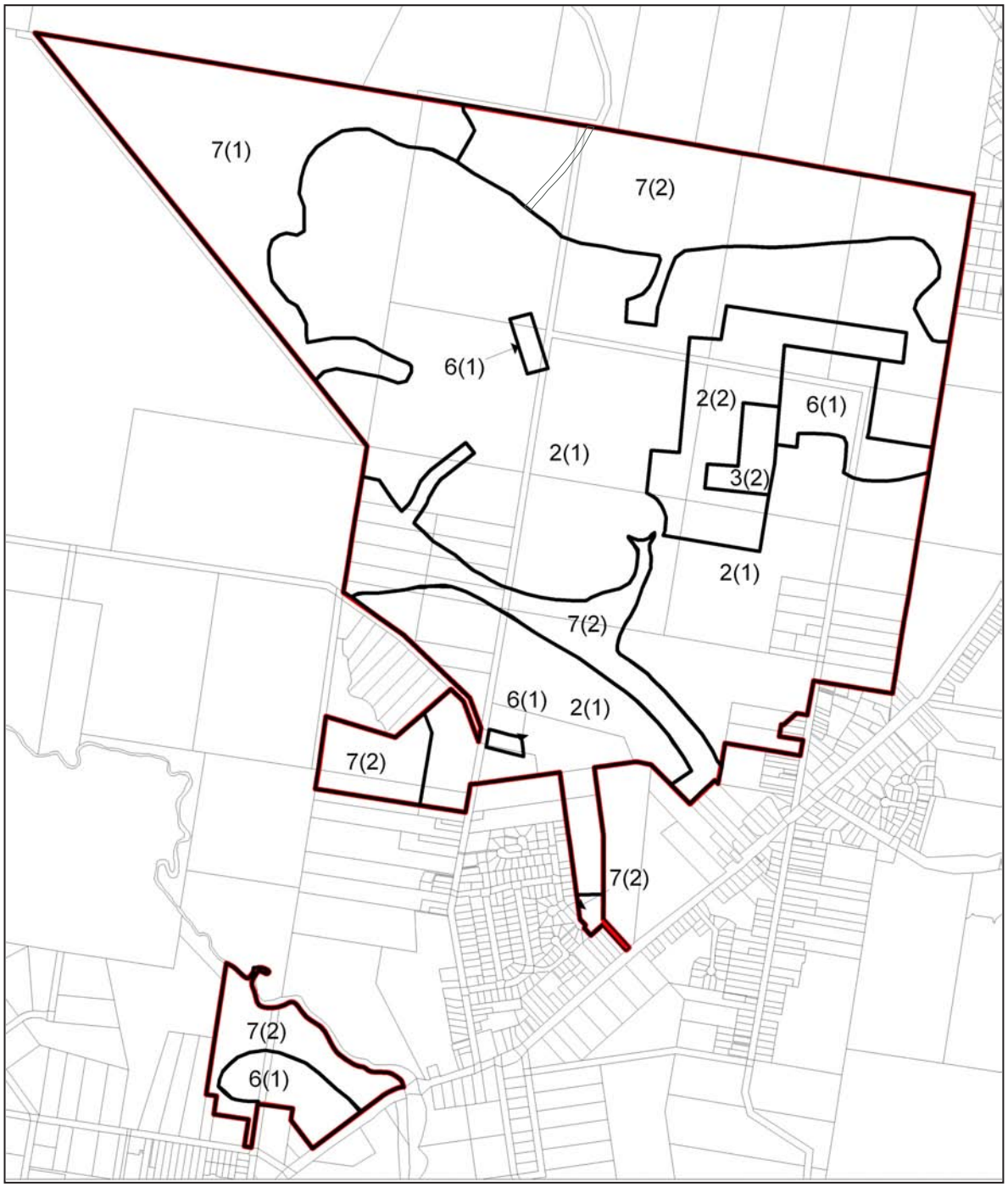
Development Type	Day	Night	Where Criteria are Already Exceeded
2 New development affected by freeway / arterial road traffic	55 LAeq,15hr	50 LAeq,9hr	Where feasible measures should be implemented to reduce noise.

The results shown in **Table 20**, below were collected

Table 20 – Noise Level Results – North East Corner North Cooranbong Residential Estate

Descriptor	Noise Level dB(A)	Time Interval
Leq,1hr	54.6	07:00 to 22:00
Leq,8hr	47.9	22:00 to 06:00
Leq,9hr	**48.2**	**22:00 to 07:00**
Leq,15hr	**53.1**	**07:00 to 22:00**
Leq,16hr	52.8	06:00 to 22:00
Leq,24hr	51.8	06:00 to 06:00

As can be seen by the results in Table 1, traffic noise levels are compliant with DECC's criteria of 55 LAeq,15hr (day) and 50 LAeq,9hr (night) at worst-affected locations within the residential estate. Therefore, no special acoustic modifications will need to be incorporated into the design of the development. The proximity of the site to the F3 Freeway will not effect the successful realisation of the Concept Plan.



Not to Scale

PROPOSED ZONE PLAN

FIGURE 26

5.6 ZONING PLAN

5.6.1 Zone Table

The North Cooranbong development has the following zones proposed for the site which are represented in the above plan.

2(1) - Residential Zone
2(2) - Residential (Urban Living) Zone
3(2) - Urban Centre (Support) Zone
6(1) - Open Space Zone
7(1) - Conservation (Primary) Zone
7(2) - Conservation (Secondary) Zone

8.0 DRAFT STATEMENT OF COMMITMENTS

The following commitments have been compiled based on the environmental assessment undertaken in the preparation of this report.

Table 21 – Draft Table of Commitments

Subject	Commitments	Approved by Whom	Timing
Regional Planning Agreement	A Voluntary Planning Agreement will be executed between Johnson Property Group and the Minister for Planning to provide for the timely delivery of regional infrastructure.	Minister of Planning	Prior to Concept Plan approval.
Local Planning Agreement	A Voluntary Planning Agreement will be executed between Johnson Property Group and Lake Macquarie City Council to provide for the timely delivery of local infrastructure and community services. The following summarises local infrastructure and community services to be provided under this commitment: ▪ Onsite Neighbourhood Park, Dog Exercise Area and Sporting Complex; ▪ 2 x Local Parks; ▪ Offsite Neighbourhood Park and Sporting Complex (referred to as Cooranbong Town Common); ▪ Cycleways; ▪ Contribution toward district jetties; ▪ Contribution toward regional Open Space; ▪ Onsite Multi-purpose Centre; ▪ Contribution to existing Libraries; ▪ Community Bus and Community Worker; ▪ Roads and Traffic Management upgrades.	Lake Macquarie City Council	Prior to Development Application being approved for Stage 1.

Development Staging Plan	A development Staging Plan will be submitted. The staging plan will address: ▪ Total lots approved ▪ Lots proposed for each subsequent stage and any minor revisions for the concept plan approval or previous staging plan ▪ Average lots sizes and areas	Lake Macquarie City Council	With the Development Application for each stage, for subdivision and infrastructure works.
Stormwater Management Plan	A Water Sensitive Urban Design (WSUD) Strategy will be prepared. The WSUD Strategy will conform to statutory, Council and DECC guidelines. This will provide detailed strategies for the management of stormwater, water detention and retention within urban area and included on-going monitoring of water quality.	Consent Authority	To accompany the development application for Stage 1
Flooding	A more detailed flood modelling assessment will be undertaken on all drainage lines within that Stage as part of the submission of future applications for subdivision and works to determine the full extent of flooding.	Consent Authority	To accompany development application for Stage 1.
Soil Erosion	For Construction Certificate for residential development detailed erosion and sediment control plans will be submitted during each major stage of development.	Consent Authority	To accompany Construction Certificate for each stage.
Infrastructure Provision	Provide: ▪ Non-potable water supply ▪ Trunk infrastructure o Sewer o Water o Electricity o Telecommunications o Natural Gas	Consent Authority	At Linen Plan Approval
Child Care Centre	To provide a child care centre to meet the needs of the locality in line with the level of demand for places in Cooranbong.	Consent Authority	When local capacity requires
Bushfire	To provide adequate bushfire planning, management and mitigation for future residential areas	Consent Authority	Prior to Concept Plan approval
Acid Sulphate	To sufficiently mitigate and	Consent	To accompany

Management Plan	manage potential impact on Acid Sulphate Soils resulting from future site works.	Authority	development application at the time the application seeks approval of the Cooranbong Town Common sporting facility / neighbourhood park
Management Plan for Reserves	To provide management plans for reserve areas as shown on the Concept Plan for a period of 5 years	Consent Authority	To accompany development application for Stage 1.
Management Plans for Parks and Community Facilities	To manage parks and community facilities which form part of the Concept Plan for a period of 5years	Consent Authority	To accompany development application at the time the application seeks approval of the applicable park or community facility.

Regional Voluntary Planning Agreement

The following is indicative and summarises proposed regional infrastructure to be provided as part of the North Cooranbong proposal. A formal Regional Voluntary Planning Agreement will be exhibited separately, however the below provides an indicative summary of the commitments to be made in this document.

We understand that the below values have been endorsed by the State Government's Regional Infrastructure Panel.

Table 22 – Regional VPA summary. *Assuming a lot yield of 2,500 residential lots

Agency	Scope of Works	Regional Infrastructure Panel Allocated Cost / Value	Timing	How works will be delivered
Roads and Traffic Authority	Traffic works on the RTA controlled road network, including: • Intersection upgrade at Freeman's Drive / Mandalong Road, Morisset • Roadworks on Mandalong Road to Gimberts Road • Intersection upgrade at Dora Creek onto Wangi Road	$30,000,000 ($12,000 / lot*)	To be defined in the Regional Voluntary Planning Agreement	Works In Kind
Department of Environment and Climate Change	Environmental offsets to achieve a maintain / improve biodiversity outcome. Funds to go toward priority conservation corridor defined in DECC's draft Regional Conservation Plan.	$1,980,000 ($792 / lot*)	To be defined in the Regional Voluntary Planning Agreement	Cash contribution
Ministry of Transport	Start up bus services based on the following parameters: • 1 bus per 1200 people; • $250,000 per new bus; • Subsidy for 5 years;	$5,077,500 ($2,031 / lot*)	To be defined in the Regional Voluntary Planning Agreement	Cash contribution
Department of Education	Contribution for 4ha school site	$5,310,000 ($2124 / lot*)	To be defined in the Regional Voluntary Planning Agreement	4ha land dedication or cash contribution
Total		$42,367,500 ($16,947 / lot*)		

Environmental Offsets

The following environmental offsets / commitments also apply:

- Mason's land was acquired by Johnson Property Group in early 2006 for primarily conservation offsets and after advice from Lake Macquarie City Council. The proposed conservation land in Mason's land will be transferred to the value of $4,000,000 (being the purchase price in early 2006);
- $5,658,981 works in kind contribution toward rehabilitating & maintaining proposed conservational within North Cooranbong residential Development area. This includes preparation of a rehabilitation management plan and employment of 2-part time staff to conduct rehabilitation and management of onsite conservation land;
- $1,081,725 works in kind contribution toward rehabilitating and maintaining proposed conservation land within the North Cooranbong Residential Development area;
- In addition to the endowment fund under point 4 above, progressive dedication of proposed conservation land within the North Cooranbong Residential Development area to Lake Macquarie City Council.

9.0 SUMMARY & JUSTIFICATION

This report has addressed the requirements of the Director General by providing an assessment of the site in statutory, strategic and environmental contexts as outlined in the DGR's. In addition justification for the project will now be demonstrated as well as discussion on possible alternatives to the project including the 'do nothing' alternative.

9.1 Statutory Planning

A full review of the legislation relevant to the proposed project is provided in Section 3 of this report. In Section 3 it is shown that the objectives of the EPI's relevant to the subject site and project are all consistent with the concept plans.

The site represents an important asset in providing adequate land supply for the growth of the region. This is evident in the site's identification in the Lower Hunter Regional Strategy as a significant growth qre to underpin the Morrisett area., For this reason the site is considered State Significant under the Act. A full description of the State Significance is given in Section 4 and ***Appendix F*** of this report. In line with SEPP (Major Projects) 2005, the State Significant Site Study shows the importance of the site at State and Regional scales.

Ultimately the provision of approximately 2500 residential lots and associated infrastructure and community facilities will fulfill the objectives of the relevant planning policy and legislation.

9.2 Site Suitability & Implications of Proposed Land Uses

A full review of the existing site in relation to the environmental and past human impacts is provided in Section 2 of this report. Section 5 then provides a full explanation of the concept plan for the subject site. The Concept Plan is also attached in ***Appendix P*** for reference. The creation of the concept plan has taken into careful consideration the implications of Section 2 of this document to develope a concept that is both sensitive to the existing environmental features of the site, while providing good development outcomes for the wider community.

The concept plan has been created to accommodate the environmental feature of the site and significant investigation was undertaken to ensure the environmental constraints and opportunities were fully documented prior to the completion of the concept plan. Among studies undertaken were:

- Biodiversity, Flora and Fauna Assessment,
- Water Quality and Management reporting,
- Bushfire Management, Aboriginal and European Heritage Assessments,

- Economic Impact Assessment,
- Social / Community Impact Assessment,
- Geological Investigations, and
- Traffic and Transport Studies.

The Draft Statement of Commitments (Section 8.0) outlines how the details of theses various reports will be incorporated into future site planning to ensure the ongoing development of the site will be done in a manner which is sympathetic to the site, the wider environment and the needs of the community.

9.3 Public Interest

As identified in the Lower Hunter Regional Strategy, the region will experience considerable population growth in the future increasing demand when supplies of existing residential stocks are already under pressure. Housing affordability has become a national issue.

While the concept plan will be able to assist in reducing the housing pressure in the region the proposal will have additional benefits. Additional planning for the needs of the future community of the site has identified the need for open space and community facilities which will be provided for the wider public benefit.

9.4 Ecologically Sustainable Development & Climate Change

As a result of the initial baseline studies, undertaken as part of the Environmental Assessment of the site, a close understanding of the environmental principles of the site has been obtained. In addition the increasing need for developments to be ecologically sensitive has resulted in the concept plan being planned around the existing environmental characteristics of the site. As detailed in Section 7.12 of this report, the environmental characteristics of the site, while unique and important, support the capacity of the site to house future development.

In terms of climate change, Section 7.12 also addresses the impacts of the proposal. An assessment of the potential future carbon emissions has enabled a number of targets to be set. At this stage of the development process, these are broad figures and can provide initial guidance in the future planning and development of the suburb. Continuing reviews of these targets at staging and subdivision stages will ensure continual consideration of climate change issues.

Additional sustainability and climate change scrutiny will take place through the application of the BASIX SEPP to ensure that the sustainability and energy targets of the Government are met.

9.5 Consideration of Alternatives

As part of the ongoing development of the site, the concept plan has been evolving as a greater understanding of the environmental and social constraints and opportunities of the site has been obtained. In order to fully appreciate the concept and consider all possible outcomes, alternatives must also be considered.

9.5.1 The 'Do Nothing' Alternative

As the site represents a major part of the future residential land supply in the Lower Hunter, the 'do nothing' alternative would have regional implications for the regional housing market. Without any development of the subject site there would be an immediate loss of approximately 2500 residential lots from the LHRS. Importantly the site represents the major source of future residential land in the west lakes area. Without the proposed development there would be an increased demand for housing within the area which could not be otherwise met.

It is also important to note that the growth of the area has seen community facilities and services coming under pressure as they are increasingly unable to meet the demands of the community. The swell in population and the proposed community facilities and development contributions will provide much needed increase in these services.

Importantly the subject site represents a partially disturbed area relatively free of environmental constraints. If the development of the subject site was to be delayed or prevented, it may put pressure on land which cannot provide the sustainability and ecological outcomes of the subject site. It would also not secure environmental corridors in the area if the land were left as is.

The subject site represents an excellent opportunity to advance the objectives of the LHRS for the benefit of the environment and the community. To do nothing would put increased pressure on alternative land stocks which would be unable to match the ability of the subject site to accommodate the expected growth in the region.

9.5.2 Alternative Land Use Configurations

As previously mentioned the development of the current concept plan is the result of carefully examining the site, its constraints and opportunities. Given the environmental values and opportunities of the site, the concept layout has been designed to enable protection of key riparian corridors and places of high environmental and visual importance. With the areas defined the concept layout was then formulated to provide efficient movement through the site giving future residents access to facilities and open space.

Alternatives can therefore be considered limited as any layout would have to be sensitive to those features of the site mentioned above. The proposed layout will allow the residential yield to maximise the benefit to the community without significantly compromising the environmental values of the site.

9.6 Consequences of not Proceeding

The subject site and concept plan have been shown to be complimentary to the benefit of the community and the environment. The consequences of the proposal not proceeding may include the following:

- Increased housing pressure within the locality and wider region;
- Increased pressure on the residential land stock, possibly resulting in the development of land which is not as well suited to residential development as the subject site;
- Uncertainty for existing residents of Cooranbong as to whether they will continue to suffer as a result of inadequate community facilities;
- If the proposal did not proceed, the aims and objectives of the Lower Hunter Regional Strategy would be compromised and the continued growth of the region would be subject to increasing uncertainty in a housing climate which cannot afford further setbacks.

The future residential development of the north Cooranbong suburb will provide the regional community with a valuable residential land resource to ease the current housing pressure. The site represents an ecologically and social sound opportunity to promote and achieve the objectives of the Lower Hunter Regional Strategy for the benefit of the region. To not proceed would be to the detriment of the community and delay the provision of an important land stock.

9.7 Conclusion

It can be demonstrated that the development of the proposed North Cooranbong development is a sound opportunity to provide the community with a new land resource that will meet the needs of the community and reinforce the sustainability of this area as a residential precinct.. The proposal will assist in achieving the objectives of the Lower Hunter Regional Strategy by enabling the timely release of serviced land.

While the site has constraints it is contended that the concept plan as proposed represents a balanced position in conserving the important environmental attributes of the site while providing a viable role out of residential land in line with the objectives of the Lower Hunter Regional Strategy. This is further reinforced by contributions to regional and local infrastructure outlined in the VPA's.

The development of this site is critical in providing the residential base needed on the western side of the Lake to underpin the potential of Morisset to develop as a Regional Centre. It is ideally situated to contribute and integrate into the existing community. For these reasons the proposed development is submitted for consideration.

It is recommended that the supporting Concept Plan and State Significant Site Study be approved

PUBLIC APPLICATION

Cooranbong Water

Appendix 3.5.1(c) Planning Proposal RZ-3/2014

flow systems

JOHNSON PROPERTY GROUP

7 May 2014

The General Manager
Lake Macquarie City Council
Box 1906
HUNTER REGION MAIL CENTRE NSW 2310

Attn: Mr Grant Alderson

Submission –
Amendment to draft Lake Macquarie Local Environmental Plan 2013
Additional North Cooranbong State Significant Site Release Area Lands
Lot 12, DP 1158508 (617 Freemans Drive, Cooranbong)
Part Lot 1, DP 3533 (80 Central Road, Cooranbong)

Dear Grant,

I write with reference to:

1. JPG's initial submission emailed to Council on 9 April 2014;
2. Our meeting on 22 April 2014;
3. Your letter dated 28 April 2014; and
4. Our various email communications

I present for Council's consideration the attached Planning Proposal report relating to certain lands at Cooranbong. Primarily the land sought to be rezoned is required for utility infrastructure purposes to service the Part 3A approved 2,500 residential lots within the North Cooranbong estate. The infrastructure will be provided by Flow Systems, similar to that which Council pursued with Flow Systems for the Wyee lands, subject to securing the necessary Government operational approvals under the provisions of the Water Industry Competition Act legislation. Flow Systems have commenced this process and expect to submit their IPART application on 6 June 2014.

Preliminary discussions have been held with IPART and they have made it clear that if we are required to pursue a rezoning of the land to enable the use of the Infrastructure SEPP, that they will require some clear evidence of the likely success of the rezoning or they will likely hold up the assessment of the licence application. They have also indicated that they can not recommend a licence be issued by the Minister until either the rezoning is complete or Part 4 consent has been granted. In regard to the Part 4 matter, we are in dialogue with Council's Chris Dwyer.

As you will see in the attached report, and as discussed, the rezoning proposal relates to two separate areas, being:

- Part Lot 1, DP 3533 for the purpose of establishing a potable water reservoir site above RL 40m AHD;
- Lot 12, DP 115808 for the purpose of:
    - sewage, recycled water and potable water utility infrastructure

Level 12, 48 Hunter Street
Sydney NSW 2000

PO Box A1308
Sydney South NSW 1235

T 02 8023 8888 johnsonpropertygroup.com.au

- o environmental conservation; and
- o residential

Please let me know when Phase 1 payment needs to be made.

Can you please let me know the date and time of the RAP meeting as I would also like to take you up on your offer for us to discuss this matter with RAP attendees.

For reasons mentioned, the rezoning of this land is essential for continued roll out of the State Significant North Cooranbong estate. Council's earliest attention to process this matter is appreciated.

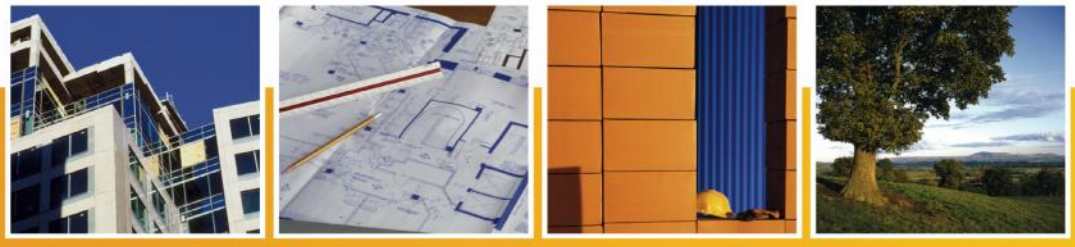
Should you wish to discuss the contents of this correspondence please do not hesitate to contact me on 0408 991 888 or email bryang@johnsonpropertygroup.com.au.

Yours sincerely
Johnson Property Group

Bryan Garland
Development Director

cc Tony Farrell (Lake Macquarie City Council)
Sharon Pope (Lake Macquarie City Council)
Iain Moore (Lake Macquarie City Council)

PLANNING PROPOSAL



For

Amendment to
Draft Lake Macquarie Local Environmental Plan 2014

Prepared for

Johnson Property Group Pty Ltd

May 2014

Project 14/008

First Floor
44 Church Street
(PO Box 40)
Maitland NSW 2320

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Contents

PART 1 OBJECTIVES AND BACKGROUND

Local Government Area:	City of Lake Macquarie
Name of Draft LEP:	DRAFT Lake Macquarie Local Environmental Plan 2014
Owner:	Peter Edmund Thomson & Barbra Joan Thomson 617 Freemans Drive Cooranbong NSW 2265 And Australasian Conference Association Limited Locked Bag 2014 Wahroonga NSW 2076
Applicant:	Bryan Garland Johnson Property Group P/L PO Box A1308 Sydney South NSW 1235
Subject Land:	Lot 12 DP 1158508 (617 Freemans Drive, Cooranbong) and Part Lot 1 DP 3533 (80 Central Road, Cooranbong)
Maps and Plans:	Attachment 1- Site Locations on Current North Cooranbong Masterplan Attachment 2 – Council's Proposed Zoning – DRAFT Lake Macquarie Local Environmental Plan 2014 Attachment 3 – Indicative Proposed Zoning Lot 12 DP 115808 – Amendment DRAFT Lake Macquarie LEP 2014 Attachment 4 – Indicative Proposed Zoning Part Lot 1 DP 3533 – Amendment DRAFT Lake Macquarie LEP 2014 Attachment 5 – Proposed zoning and indicative layout - Lot 12 DP 115808 Attachment 6 – Proposed zoning and indicative layout - Lot 1 DP 3533 Attachment 7 – Site Ecology (desktop) - Lot 12 DP 115808 Attachment 8 – Flow Systems recycling and water utility facility – Concept Drawings

OBJECTIVES

The objective of this proposal is to seek Lake Macquarie City Council's support for an amendment to Draft LMLEP 2014.

The main purpose of the proposed amendment is primarily to provide for the construction of a sewerage treatment, recycling and water utility facility, essential to service the entire North Cooranbong urban growth area; thus allowing for timely, flexible, efficient and economical delivery of the approved Concept Masterplan. to which State Environmental Planning Policy (Major Projects – North Cooranbong) Amendment 2008 applied (gazetted 5 December 2008).

This includes:

- The establishment of a potable water reservoir site above RL 40m AHD for the future installation and operation of potable water reservoir tanks.
  Lot 1 DP 3533 *(Refer to Map1 - Site Locations on Current North Cooranbong Masterplan – below)*

- The establishment of sewage treatment facilities, which need to be positioned on lower lying land close to existing HWC sewer manhole infrastructure so that utility-to-utility arrangements are made for discharge of excess sewer / recycled water into the HWC network.
  Lot 12 DP 115808 *(Refer to Map1 - Site Locations on Current North Cooranbong Masterplan and Map 5 – Proposed zoning and indicative layout Lot 12 DP 115808– below)*

- The logical extension of the North Cooranbong urban growth area to reinforce a residential link between the existing Cooranbong settlement and the North Cooranbong urban release area. This provision will have the effect of further ensuring the synergy between the existing Cooranbong settlement and the North Cooranbong urban release area by introducing a populated, integrated path of development southwards from the North Cooranbong urban release area, which is currently non-existent. The introduction of linking connecting road through this integrated path, which is already approved will alleviate future traffic flows between the two.
  Lot 12 DP 115808 *(Refer to Map1 - Site Locations on Current North Cooranbong Masterplan and Map 5 – Proposed zoning and indicative layout Lot 12 DP 115808– below)*

- An Environmental Conservation Zone on flood affected land and to offer a link in the wildlife corridor network for the area thus contributing to the successful environmental outcomes of the master plan. It is anticipated that this additional E2 Environmental Conservation zone land will be added to the other approximately 120ha of Environmental zone land within the estate and will be transferred with it to Lake Macquarie City Council for public ownership, subject to agreement by Council. As such, Johnson Property Group would propose to modify the existing North Cooranbong Planning Agreement.
  Lot 12 DP 115808 *(Refer to Map1 - Site Locations on Current North Cooranbong Masterplan and Map 5 – Proposed zoning and indicative layout Lot 12 DP 115808– below)*

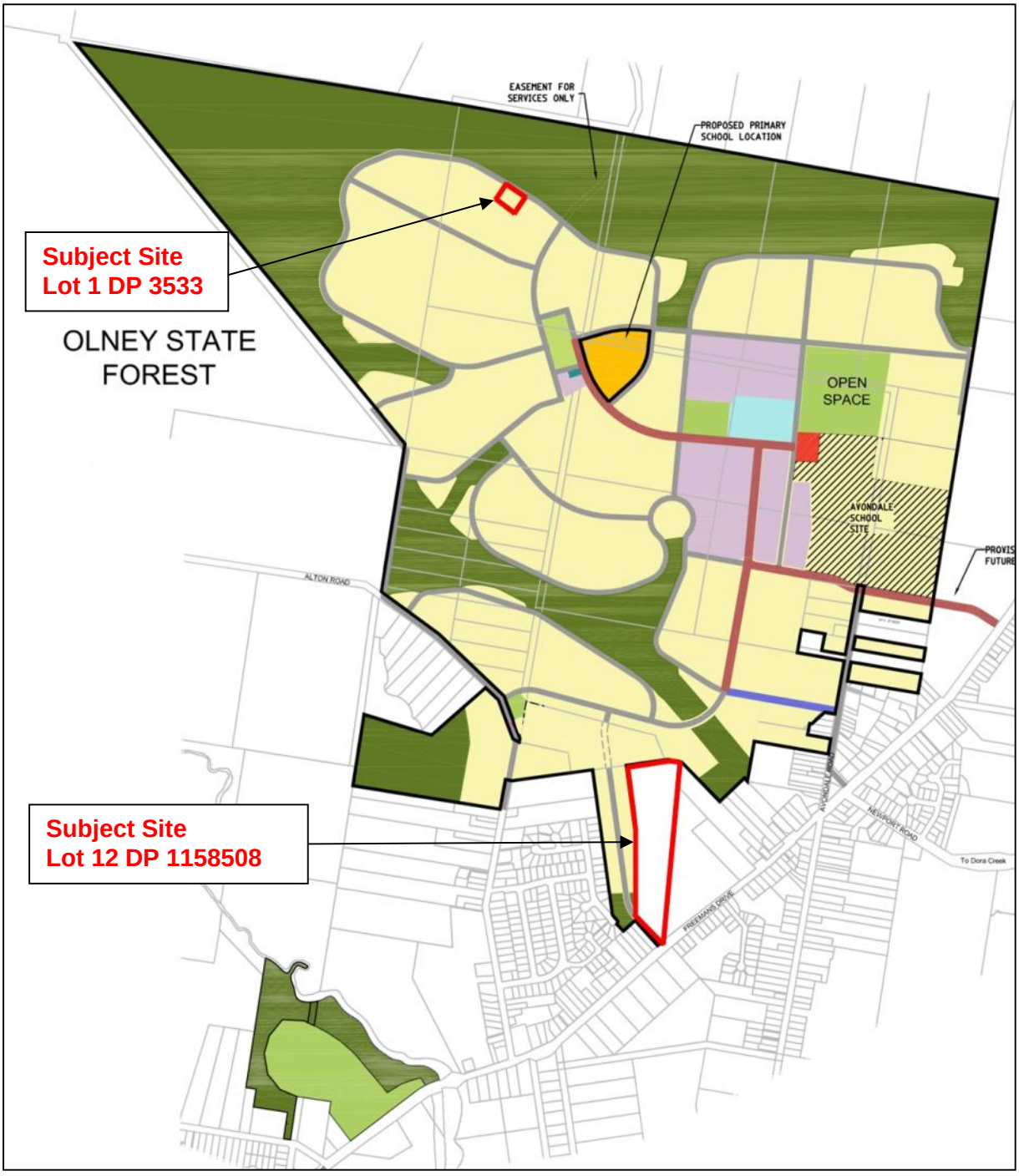
- The provision of storm water drainage and detention systems needed to support the approved residential development area to the west of the subject site and any

proposed additional residential development which may occur as a result of this proposal.

Lot 12 DP 115808 *(Refer to Map1 - Site Locations on Current North Cooranbong Masterplan and Map 5 – Proposed zoning and indicative layout Lot 12 DP 115808– below)*

The proposed rezoning of part of Lot 1 DP 3533 represents a minor amendment to the approved Concept Masterplan which will enhance the use of the land by supporting the intent of the approved Concept Masterplan.

The proposed rezoning of Lot 12 DP 115808 represents a rezoning separate from the previously approved Concept Masterplan and as such may be considered a standalone rezoning.



Map1 - Site Locations on Current North Cooranbong Masterplan

Map 5 – Proposed zoning and indicative layout Lot 12 DP 115808

BACKGROUND

The proposed amendments affect 2 separate lots and relate predominantly to amending the zoning to permit the construction of services and access to meet the needs of the approved North Cooranbong Urban Release Area.

The subject land comprising Lot 12 DP 1158508 did not form part of the land to which State Environmental Planning Policy (Major Projects – North Cooranbong) Amendment 2008 applied (gazetted 5 December 2008). This was due to the position held by the owner of the land at the time, which was that they did not want to have their land part of the 2008 rezoning. Since then however, the transfer of the land to Johnson Property Group control has now been agreed upon, in order to form an extension of the North Cooranbong urban release area.

In the original proposal it was envisaged that water and sewer would be provided by Hunter Water, however changes to legislation has allowed the owners to consider other alternatives that can offer a better and quicker outcome. The approved HWC strategy is for the same 2500 lots that will be serviced under the alternative proposal.

Lot 12 DP 115808 is currently zoned 10 Investigation (Urban / Conservation) pursuant to Lake Macquarie Local Environmental Plan 2004; and is proposed by Council to be zoned RU6 Transition under draft Lake Macquarie Local Environmental Plan 2014.

The provision of an SP2 Infrastructure zone on this land will enable the establishment of a sewerage, recycled water and potable water treatment facility to service the whole estate, subject to securing the necessary Government development approvals. This facility will be provided by a licensed private water utility pursuant to the provisions of the Water Industry Competition Act 2006.

The sewerage treatment and water utility facility sought to be established is similar to that which Council pursued with Flow Systems for the Wyee lands; and is subject to securing the necessary Government operational approvals under the provisions of the Water Industry Competition Act legislation. Flow Systems have commenced this process and a licence application is likely to be made to IPART by 6 June 2014. We envisage a 6 month assessment process by IPART.

Preliminary discussions have been held with IPART who have indicated that if a rezoning of the land to enable the use of the Infrastructure SEPP is required; that they cannot recommend a licence be issued by the Minister until the rezoning is complete. There is therefore some urgency to proceed with this rezoning request in order to continue the timely delivery of residential land to the market.

We ask that Council consider this application in the context of the above information provided by IPART.

PART 2 EXPLANATION OF PROVISIONS

DRAFT Lake Macquarie Local Environmental Plan 2014

Amendment Applies To	Explanation of the Provision
DRAFT LM LEP 2014 Standard Instrument – Land Zoning Map - Sheet LZN_006	The proposal involves rezoning: **Lot 12 DP 115808** 3.262 hectares from: Zone RU6 Transition to Zone R2 Low Density Residential 1.688 hectares from: Zone RU6 Transition to Zone SP2 Infrastructure (Drainage and Sewer) 0.882 hectares from: Zone RU6 Transition to Zone E2 Environmental Conservation **Part Lot 1 DP 3533** 0.419 hectares from: Zone R2 Low Density Residential to Zone SP2 Infrastructure (Water Supply) *Refer to Map1 - Site Locations on Current North Cooranbong Masterplan and Map 5 – Proposed zoning and indicative layout Lot 12 DP 115808 above* *Indicative zoning maps contained in Part 4 – Mapping as Attachment 3 and Attachment 4*

PART 3 JUSTIFICATION FOR PROVISIONS

SECTION A - NEED FOR THE PROVISIONS

Q1 Is the planning proposal a result of any strategic study or report?

This planning proposal relates to land which forms part of the North Cooranbong urban release area. North Cooranbong has been identified under the Department of Planning's Lower Hunter Regional Strategy and Lake Macquarie Council's Lifestyle 2030 Strategy as a residential growth area.

The proposed LEP amendment will allow for a logical extension of and the provision of adequate infrastructure for the North Cooranbong urban release area, thus reinforcing the aims and objectives of the Lower Hunter Regional Strategy and the Lake Macquarie Council's Lifestyle 2030 strategic visions.

Q2 Is the planning proposal the best means of achieving the objectives or intended outcomes, or is there a better way?

The planning proposal is the best means of achieving the objectives or intended outcomes.

The inclusion of the Zones SP2 Infrastructure will together make allowance for the provision of a Water Recycling/Sewer Treatment Facility, which will serve the North Cooranbong urban release area. As has been well documented, there is currently not enough capacity in the Hunter Water sewer system to serve the full development. This proposal offers an economical, environmentally sustainable and flexible solution to this problem in accordance with the provisions of the Water Industry Competition Act 2006.

The Cooranbong Local Water Centre option, delivered, operated and maintained by Flow Systems, was adopted by the developer as the preferred option due to limited off-site impacts, economic viability. It also makes a significant contribution to sustainability through the provision of treated recycled water back to the residential area.

The location of the sites, have been identified due to their strategic location within the overall design of the residential subdivision. Other options considered (such as 60 Avondale Road) would have been located closer to existing residents who had a poor perception of sewage treatment facilities being located so close to their homes due to the perceived impacts of traditional treatment facilities. By repositioning the facility to the subject land, it means that there is an increased setback of the facility from existing residents whilst acknowledging the low impact of the proposal will be known before new landowners purchase the surrounding properties. Irrespective, the type of system proposed is a closed system with negligible impacts.

The **Zone SP2 Infrastructure (Part Lot 1 DP 3533)** is elevated (above the required RL 40) and therefore offers an ideal location for the water storage facility to service North Cooranbong Residential Estate. The proposed location was also selected adjacent to the conservation zone land to provide opportunities for bushfire protection of surrounding lands.

The **Zone SP2 Infrastructure (Lot 12 DP 115808)** will enable the provision of sewage treatment facilities, which needs to be positioned on lower lying land close to existing HWC sewer manhole infrastructure so that utility-to-utility arrangements are made for discharge of excess sewer / recycled water into the HWC network.

The **Zone SP2 Infrastructure (Lot 12 DP 115808)** will further enable the provision of storm water drainage and detention systems needed to support the approved residential development area to the north and west of the subject site and any proposed additional residential development which may occur as a result of this proposal.

The inclusion of the **R2 Low Density Residential Zone** (Lot 12 DP 115808) will reinforce a residential link between the existing Cooranbong settlement and the North Cooranbong urban release area.

This provision will have the effect of further ensuring the synergy between the existing Cooranbong settlement and the North Cooranbong urban release area by introducing a populated, integrated path of development southwards from the North Cooranbong urban release area, which is currently non-existent. The introduction of an additional linking road through this integrated path will also further alleviate future traffic flows between the two.

The proposed **E2 Environmental Conservation Zone** component of the subject site (Lot 12 DP 115808) is flood affected and therefore has limited potential for the provision of services to the North Cooranbong urban release area.

This land however forms a link in the wildlife corridor network for the area and maintenance of this land for that purpose is crucial to the successful environmental outcomes of the master plan. It is anticipated that this additional E2 Environmental Conservation zone land will be added to the other approximately 120ha of Environmental zone land within the estate and will be transferred with it to Lake Macquarie City Council for public ownership, subject to agreement by Council.

Q3 Is there a net community benefit?

A Net Community Benefit Test is used to help assess the merits of the planning proposal.

The rezoning will facilitate the provision of water and sewer facilities to support a major residential release already approved under State Environmental Planning Policy (Major Projects – North Cooranbong) Amendment 2008 applied (gazetted 5 December 2008).

The type of system is approved for use in other areas; and the use of alternative systems and providers is sanctioned by IPART under the Water Industry Competition Act 2006 (WICA).

Ultimately it allows the developer to consider alternatives that may reduce cost to the ultimate purchaser and provide better environmental outcomes, all of which is in the public interest.

SECTION B - RELATIONSHIP TO STRATEGIC PLANNING FRAMEWORK

Q4 Is the planning proposal consistent with the objectives and actions contained within the applicable regional or sub-regional strategy (including the Sydney Metropolitan Strategy and exhibited draft strategies)?

The planning proposal is consistent with the objectives and actions contained within the applicable regional or sub-regional strategy.

Lower Hunter Regional Strategy (2006-2013)
Lower Hunter Regional Strategy sets a clear and sustainable direction for growth that will continue to evolve to reflect long-term trends and build on the region's strengths. The primary purpose of the Strategy is to ensure that adequate land is available and appropriately located

to sustainably accommodate the projected housing and employment needs of the Region's population over the next 25 years. It is estimated that additional 115,000 dwellings are required to house the growing population in the region during this period.

Cooranbong is listed as one the major priority land release areas. The strategy identifies the clear need to coordinate the release of land in alignment with infrastructure provision and infrastructure funding to achieve and orderly and efficient pattern of land use. The Strategy recommends that Councils revise their local environmental plans to be consistent with the identified urban footprint within the regional strategy.
The planning proposal seeks land use zoning changes to facilitate the provision of infrastructural services in an area that has been identified as a priority land release area in the LHRS which is consistent with the objectives and actions contained in the Strategy.

Q5 Is the planning proposal consistent with the local council's Community Strategic plan, or other local strategic plan?

The planning proposal is consistent with LS 2030 Strategic Directions. The proposal is responsive to the environment and will contribute to a well-serviced and equitable community; contribute to a well-designed and liveable community; contribute to the progress and prosperity of Lake Macquarie, and contribute to an efficient and accessible movement system.

The planning proposal is consistent with the **LS 2030** core values of sustainability, equity, efficiency, and liveability, which aim to:

- integrate environmental, economic, social and cultural elements so as to ensure Lake Macquarie's resources are respected, preserved, enjoyed and utilised in a sustainable manner both for current and future generations,
- contribute to the distribution and improvement of access to employment, housing, urban services, community facilities, environmental quality and recreation, and provides for a range of lifestyle opportunities to suit all members of the community.
- contribute to a land use structure that provides a comprehensive approach to the design of movement networks, open space and water management systems within a wide range of living, employment and leisure opportunities, capable of adapting over time as the community changes.
- contribute to the development of a well designed, attractive, and functional land use structure that will result in a diverse, accessible, compatible, and vibrant community that supports security, safety, identity, historic continuity, and cultural diversity.

The planning proposal is consistent with the Objectives **of LMLEP 2004 and draft LMLEP 2013**, to achieve development of land that is in accordance with the principles of ecologically sustainable development by promoting balanced development of the land, and implementing LS 2030.

New residential development requires the co-ordinated provision of reticulated water and sewerage services.

The proposal is seen as the best option to manage sewage from the development as there are no off-site impacts. It makes a significant contribution to sustainability through the provision of refined water back to the residential area for toilet flushing, washing machines and irrigation and therefore satisfies the requirements of BASIX for potential homeowners.

As the local water centre is scalable it allows treatment capacity to increase in line with the anticipated residential development and the volume of sewage to be treated. The reticulation system proposed for Cooranbong is a pressure sewer system which eliminates wet weather infiltration, thereby eliminating wet weather overflows of sewage to the environment and minimising the size of the local water centre required.

The alternative(s) to the proposed Cooranbong Local Water Centre is to build a traditional local sewage treatment plant with discharge of a low quality effluent to the local waterway or, more expensively, to pipe the sewage to an existing sewage treatment plant for treatment and disposal. A gravity sewerage system would have a higher impact during construction, require sewage overflow points throughout the network and be subject to greater ingress of groundwater and stormwater thereby increasing the treatment capacity required.

These alternatives would be more expensive, take longer to implement, have greater potential environmental impacts, and fail to achieve sustainability initiatives for water re-use.

The incumbent water authority, Hunter Water, is not able to provide the flexibility, sustainability, innovation and cost savings to ensure the efficient and sustainable delivery of this important supply of housing stock. The private sector (Flow Systems Pty Ltd) has therefore been engaged to supply these services.

The inclusion of **R2 Low Density Residential Zone** (Lot 12 DP 115808) forms a logical extension of the North Cooranbong urban growth area to reinforce a residential link between the existing Cooranbong settlement and the North Cooranbong urban release area, thus enhancing the values of sustainability, equity, efficiency, and liveability.

This provision will have the effect of further ensuring the synergy between the existing Cooranbong settlement and the North Cooranbong urban release area by introducing a populated, integrated path of development southwards from the North Cooranbong urban release area, which is currently non-existent. The introduction of a linking connecting road through this integrated path, which is already approved, will alleviate future traffic flows between the two.

The inclusion of E2 Conservation Zone (Lot 12 DP 115808) enhances the values of sustainability, equity, efficiency, and liveability, by enabling a link in the wildlife corridor network for the area thus contributing to the successful environmental outcomes of the master plan. It is anticipated that this additional E2 Environmental Conservation zone land will be added to the other approximately 120ha of Environmental zone land within the estate and will be transferred with it to Lake Macquarie City Council for public ownership, subject to agreement by Council.

Q6 Is the planning proposal consistent with applicable state environmental planning policies?

An assessment has been undertaken to determine the level of consistency the proposal has with relevant state environmental planning policies (SEPPs). There are no SEPPs to prohibit, or restrict, the proposed development as outlined in this planning proposal. Below is an assessment of relevant SEPPs against the Planning Proposal.

SEPP	Relevance	Consistency & Implications
SEPP (Infrastructure) 2007	The SEPP aims to facilitate the effective delivery of infrastructure throughout the State.	*Division 18 (SEPP 2007) - Sewage Systems* SP2 Infrastructure is one of the prescribed zones in this section where sewage treatment facilities are permissible with consent. The proposal is therefore consistent with SEPP 2007

Q7 Is the planning proposal consistent with applicable Ministerial Directions (s.117 directions)?

The planning proposal has been assessed against relevant Ministerial Directions and is provided below.

Environment and Heritage

Environment Protection Zones

The objective of this direction is to protect and conserve environmentally sensitive areas.

• *To protect and maintain land that provides a transition between rural and other land uses of varying intensities or environmental sensitivities.*

• *To **minimise conflict** between land uses within this zone and land uses within adjoining zones.*

• *To identify land that requires environmental studies to substantiate the capability and suitability of land prior to rezoning.*

• *To limit development to development that will not prejudice or have the **potential to prejudice future conservation and/or development of the land.***

The proposal is consistent with this direction.

The proposed rezoning of Part Lot 1 DP 3533 represents a minor amendment to the approved Concept Masterplan. It will enhance the use of the land by supporting the intent of the approved Concept Masterplan. The inclusion of the Zone SP2 Infrastructure will make allowance for the provision of an appropriate site above RL 40m AHD for the future installation and operation of potable water reservoir tanks , which will serve the North Cooranbong urban release area.

The proposed rezoning of Lot 12 DP 115808 will allow for the establishment of sewage treatment facilities, which need to be positioned on lower lying land close to existing HWC sewer manhole infrastructure so that utility-to-utility arrangements are made for discharge of excess sewer / recycled water into the HWC network. The location of the proposal was identified as a strategic location within the overall design of the residential subdivision. Other options considered (such as 60 Avondale Road) were located closer to existing residents who had a poor perception of a sewage treatment facility being located so close to their homes due to their perceived impacts of traditional treatment facilities. By locating the proposal within part of the proposed residential development (subject to this Planning Proposal), the low impact of the proposal will be known before new landowners buy into the surrounding properties.

The inclusion of the R2 Low Density Residential zone (Lot 12 DP 115808) will allow for a vital link between the existing Cooranbong settlement and the North Cooranbong urban release area. This provision will have the effect of further ensuring the synergy between the existing Cooranbong settlement and the North Cooranbong urban release area by introducing a populated, integrated path of development southwards from the North Cooranbong urban release area, which is currently non-existent. This provision will minimise potential conflict between land uses within North Cooranbong urban release area and land uses within adjoining zones.

The proposed E2 Environmental Conservation zoned component of the subject site (Lot 12 DP 115808) forms a link in the wildlife corridor network for the area and is crucial to the successful environmental outcomes of the master plan by limiting potential to prejudice future conservation of sensitive areas within and adjacent to the North Cooranbong urban release area. This provision will further minimise potential conflict between land uses within North Cooranbong urban release area and land uses within adjoining zones

Heritage Conservation

The objective of this direction is to conserve items, areas, objects and places of environmental heritage significance and indigenous heritage significance.

The planning proposal is consistent with this direction.
An Archaeological Survey and Constraints Study for various lots on Alton Road and Freemans Drive (including Lot 1 DP 3533) was undertaken by Myall Coast Archaeological Services in July 2003, in support of the preparation of the 2008 State Significant site study (to support the rezoning) and the Environmental Assessment Report (to support the Part 3A Concept Plan).

The study concluded that the proposal would not impact on known or potential Aboriginal Cultural Heritage as the site is heavily disturbed and located well away from creek and drainage lines.

A heritage impact assessment is currently being prepared for the IPART application and will be made available to Council after the IPART application is submitted on 6 June 2014. We understand that the new survey has not picked up matters of archaeological significance on Lot 12.

Recreation Vehicle Areas

The objective of this direction is to protect sensitive land or land with significant conservation values from adverse impacts from recreation vehicles.

The planning proposal is consistent with this direction.
The proposed rezoning would contain the environmentally sensitive land in an E2 Conservation zone thereby protecting it from adverse impacts from recreation vehicles. It is also proposed that this land be transferred to Council and therefore future preservation of the environmentally sensitive nature of the land.

Housing, Infrastructure and Urban Development

Residential Zones

The objectives of this direction are:

- *to encourage a variety and choice of housing types to provide for existing and future housing needs;*
- *to make efficient use of existing infrastructure and services, and ensure that new housing has appropriate access to infrastructure and services: and*
- *to minimise the impact of residential development on the environment and resource lands.*

The planning proposal is consistent with this direction.

The northern part of Lot 12 DP 1158508 is proposed to be zoned R2 Low Density Residential. This would make the North Cooranbong residential development contiguous with the existing development in the south. The introduction of linking connecting road through this integrated path, which is already approved, will alleviate future traffic flows between the two.

The inclusion of the proposed R2 Low Density Residential Zone at Lot 12 DP 1158508 will have minimal impact on the environment and resource lands. Part of the site is identified as a narrow vegetation corridor (<200m) that links vegetation scattered throughout the rural residential allotments south of Freemans Drive with the Watagans National Park and Olney State Forest to the north. The functionality of the vegetation corridor will continue to have affect on the neighbouring lands to maintain the habitat and landscape connectivity.

A review of LMCC Vegetation Mapping indicates that vegetation within the site is made up of a number of Coastal Plains Dry Sclerophyll Forests within the northern portion of the site grading into Coastal Swamp Forest EECs to the south. Only a small portion of the lot to the south is mapped as Coastal Swamp EEC and is not proposed to be impacted upon as a result of this proposal. *(Refer to Part 4 – Mapping - Attachment 7 – Site Ecology (desktop) - Lot 12 DP 115808)*

A review of Atlas of NSW data indicates that there are no existing threatened flora and fauna records within the site.

Integrating Land Use and Transport

The objective of this direction is to ensure that urban structures, building forms, land use locations, development designs, subdivision, and street layouts, achieve the following planning objectives:

- *improving access to housing, jobs and services, by walking, cycling and public transport; and*
- *increasing the choice of available transport and reducing dependence on cars; and*
- *reducing travel demand including the number of trips generated by development and the distances travelled, especially by car; and*
- *supporting the efficient and viable operation of public transport services; and*
- *providing for the efficient movement of freight.*

The planning proposal is consistent with this direction.

The North Cooranbong Residential Estate envisages a well connected compact neighbourhood with the majority of the lots located within walking distances to facilities and amenities.

The area of Lot 12 DP 1158508 proposed to be zoned to R2 Low Density Residential adjoins the residential area of the approved master plan and will adhere to and enhance the underlying urban design principles of a well integrated masterplan.
Freemans Drive is suitable and has sufficient capacity to support the additional residential lots. Under the terms of the Planning Agreement with Council, Johnson Property Group are required to upgrade this central road connection to Freemans Drive and install traffic signals. The proposed central road connection, and the signalisation of this intersection, is not expected to affect the technical capability of the intersection as a result of the additional 40-odd residential lots created on Lot 12.

Hazard and Risk

Acid Sulfate Soils

The objective of this direction is to avoid significant adverse environmental impacts from the use of land that has a probability of containing acid sulphate soils.

The planning proposal is consistent with this direction.

The only area of the land subject to this proposal, to which this direction relates, is the southern part of Lot 12 DP 1158508 which contains Class 3 and 4 Acid Sulphate Soils. However, these affected areas are within the proposed as E2 Environmental Conservation zone where no development is anticipated; thereby eliminating any adverse environmental impacts.

Mine Subsidence and Unstable Land

The objective of this direction is to prevent damage to life, property and the environment on land identified as unstable or potentially subject to mine subsidence.

The planning proposal is consistent with this direction.

The land is not subject to mine subsidence as confirmed by the Mine Subsidence Board.
A summary report on site assessment for North Cooranbong Investigation Area was prepared by Douglas Partners in March 2005. This geotechnical investigation considered a preliminary inspection of the adjoining sites which included Lot 12 DP 1158508.

The soil conditions throughout the site were found to be non dispersive (clay). However, there is a potential for adverse impacts resulting from the erosion of silty/sandy top soil materials during and after a development. Owing to the limited quantity of such materials on site, any adverse impact can be easily prevented through mitigation measures such as silt fence, revegetation, sediment traps, drainage structures etc.

With respect to natural topography, the site is considered to have a low risk of slope instability. As localised areas of non-engineered fills were observed across the site, further investigations to establish the general soil reactivity and the extent, depth and properties of the filling are required if future development is to be carried out on the site. The subsurface condition of the site is expected to be similar to the investigated area where silty/sandy clays were observed to a depth between .45m and 3m, overlying bedrock. The preliminary investigation identified no significant geotechnical constraints that would hamper the development potential of the site.

Flood Prone Land

The objectives of this direction are:

- *to ensure that development of flood prone land is consistent with the NSW Government's Flood Prone Land Policy, and the principles of the Floodplain Development Manual 2005; and*
- *to ensure that the provisions of an LEP on flood prone land is commensurate with flood hazard, and includes consideration of the potential flood impacts both on and off the subject land.*

The planning proposal is consistent with this direction.

The southern part of Lot 12 DP 1158508 is identified as being flood prone. However, this area is proposed to be zoned as E2 Environmental Conservation Zone and thus no development anticipated.

Planning for Bushfire Protection

The objectives of this direction are:

- *to protect life, property and the environment from bushfire hazards, by discouraging the establishment of incompatible land uses in bushfire prone areas; and*
- *to encourage sound management of bushfire prone areas.*

A Bush Fire Threat Assessment was prepared by HDB in 2007, in support of the approved North Cooranbong urban release area master plan, of which Part Lot 1 DP 3533 subject to this planning proposal, forms a part.

The land described as Lot 12 DP 115808 subject to this planning proposal is located within a bushfire prone area. A bushfire assessment is being prepared as part of the IPART application and will be made available to Council on completion to support this rezoning proposal.

Regional Planning

Implementation of Regional Strategies

The objective of this direction is to give legal effect to the vision, land use strategy, policies, outcomes, and actions contained in regional strategies.

The planning proposal is consistent with this direction.

The proposed rezoning will allow for the development of an alternative servicing strategy for the North Cooranbong Residential Estate. This will enable the timely release of land in an area which has been identified in the LHRS as a priority land release area to meet the growing demand for housing in the region. In addition to this, it would also generate some additional land for low density housing thereby integrating the existing and the proposed residential developments in an orderly manner. The planning proposal will achieve the overall intent of the LHRS and is consistent with its vision, land use strategy, policies, outcomes and actions.

Local Plan Making

Approval and Referral Requirements

The objective of this direction is to ensure that LEP provisions encourage the efficient and appropriate assessment of development.

The planning proposal is consistent with this direction.

The proposed LEP provisions will encourage the efficient and appropriate assessment of a sewerage, recycled water treatment and water utility facility to service the whole North Cooranbong urban growth area.

The planning proposal will enable securing the necessary Government operational approvals under the provisions of the Water Industry Competition Act legislation. Preliminary discussions have been held with IPART who have indicated that if a rezoning of the land to enable the use of the Infrastructure SEPP is required; that this rezoning would need to be completed so that they could recommend a licence be issued by the Minister.

Reserving Land for Public Purposes

The objectives of this direction are:

- *to facilitate the provision of public services and facilities, by reserving land for public purposes; and*
- *to facilitate the removal of reservations of land for public purposes, where the land is no longer required for acquisition.*

The planning proposal is consistent with this direction.

Open space for public purposes has been provided in the approved North Cooranbong urban release area master plan, State Environmental Planning Policy (Major Projects – North Cooranbong) Amendment 2008 applied (gazetted 5 December 2008).

This proposal has no affect on the open space provisions of the approved masterplan.

Site Specific Provisions

The objective of this direction is to discourage unnecessarily restrictive site specific planning controls.

The planning proposal is consistent with this direction, and in line with current best practise.

The provisions of this planning proposal will remove *site specific planning controls which currently restrict the* intended outcomes of LMLEP 2004 and draft LMLEP 2013, the Lower Hunter Regional Strategy and the Lake Macquarie Council's Lifestyle 2030 strategic vision.

The subject land comprising Lot 1 DP 3533 is currently zoned R2 Low Density Residential and forms part of the Concept Masterplan to which State Environmental Planning Policy (Major Projects – North Cooranbong) Amendment 2008 applied (gazetted 5 December 2008).

The inclusion of the SP2 Infrastructure zone land on Part Lot 1 DP 3533, will provide opportunities for the establishment of a potable water reservior facility to service the whole North Cooranbong urban growth area; thus allowing for timely, flexible, efficient and economical delivery of the approved Concept Masterplan.

The sewerage treatment and water utility facility sought to be established is subject to securing the necessary Government operational approvals under the provisions of the Water Industry Competition Act legislation. Flow Systems have commenced this process and a licence application is likely to be made to IPART by 6 June 2014. We anticipate IPART will take 6 months to complete their assessment of this application.

The subject land comprising Lot 12 DP 1158508 did not form part of the land to which State Environmental Planning Policy (Major Projects – North Cooranbong) Amendment 2008 applied (gazetted 5 December 2008). This was mainly due to the position held by the owner of the land at the time that they did not want to have their land part of the 2008 rezoning. Since then however, the transfer of the land to Johnson Property Group control has now been agreed upon, in order to form a logical extension of the North Cooranbong urban release area.

Lot 12 DP 115808 is currently zoned 10 Investigation (Urban / Conservation) pursuant to Lake Macquarie Local Environmental Plan 2004; and is proposed by Council to be zoned RU6 Transition under draft Lake Macquarie Local Environmental Plan 2014.

The inclusion of a SP2 Infrastructure zone on this land will provide opportunities for the establishment of a sewerage treatment facility to service the entire urban release area, subject to securing the necessary Government development approvals.

The inclusion of the R2 Low Density Residential zone (Lot 12 DP 115808) will allow for a residential link between the existing Cooranbong settlement and the North Cooranbong urban release area, thus forming a logical extension of the North Cooranbong urban release area.

This provision will have the effect of further ensuring the synergy between the existing Cooranbong settlement and the North Cooranbong urban release area by introducing a populated, integrated path of development southwards from the North Cooranbong urban release area, which is currently non-existent. The introduction of an additional linking road through this integrated path will also further alleviate future traffic flows between the two.

The proposed E2 Environmental Conservation zoned component of the subject site (Lot 12 DP 115808) is flood affected and therefore has limited potential for the provision of services to the North Cooranbong urban release area.

This land however forms a link in the wildlife corridor network for the area and maintenance of this land for that purpose is crucial to the successful environmental outcomes of the master plan. It is anticipated that this additional E2 Environmental Conservation zone land will be added to the other approximately 120ha of Environmental zone land within the estate and will be transferred with it to Lake Macquarie City Council for public ownership, subject to agreement by Council.

SECTION C - ENVIRONMENTAL, SOCIAL AND ECONOMIC IMPACT

Q8 Is there any likelihood that critical habitat or threatened species populations or ecological communities, or their habitats, will be adversely affected as a result of the proposal?

The proposed rezoning has given due consideration to the ecological value of the site.

The area proposed for rezoning to SP2 Infrastructure zone within Lot 1 DP 3533, falls within the previously approved Concept Masterplan area and as such represents a site that does not contain critical habitat, threatened species, or ecological communities.

A study was undertaken by Austeco in January 2005 to identify the fauna constraints for the North Cooranbong Residential Area; in support of the preparation of the 2008 State Significant site study and the Environmental Assessment Report (to support the Part 3A Concept Plan).

The land proposed for rezoning within Lot 12 DP 115808 (with the exception of the cleared parts associated with the existing dwelling and edge areas) can be described as containing vegetation in good to moderate condition.

Part of the site is identified as a narrow vegetation corridor (<200m) that links vegetation scattered throughout the rural residential allotments south of Freemans Drive with the Watagans National Park and Olney State Forest to the north. The functionality of the vegetation corridor will be preserved to maintain the habitat and landscape connectivity.

A review of LMCC Vegetation Mapping (Stage 3) indicates that vegetation within the site is made up of a number of Coastal Plains Dry Sclerophyll Forests within the northern portion of the site grading into Coastal Swamp Forest EECs to the south. Only a small portion of the lot to the south is mapped as Coastal Swamp EEC and is not proposed to be impacted upon as a result of this proposal. Vegetation within the site is comprised of:

- MU30 Coastal Plains Smooth-barked Apple Woodland (0.8 ha)
- MU31 Coastal Plains Scribbly Gum Woodland (4.7 ha)
- MU37 Swamp Mahogany - Paperbark Forest (0.3 ha)
- MU42 Narrabeen Alluvial Sedge Woodland (0.4 ha)

A review of Atlas of NSW data indicates that there are no existing threatened flora and fauna records within the site.

A Biodiversity Study is underway for Lot 12, which will form part of the IPART application. This study will be provided to Council on completion. It will be carried out in accordance with Councils 'Biodiversity Policy and Guidelines for (LEP) Rezoning Proposals'. The outcome of the completed study will be used to determine if a biodiversity offset strategy is required.

Q9 Are there any other likely environmental effects as a result of the planning proposal, and how are they proposed to be managed?

The proposal is seen as the best option to manage sewage from the development as there are no off-site impacts.

The location of the proposed SP2 Infrastructure zone was identified as a strategic location within the overall design of the residential subdivision. Other options considered (such as 60 Avondale Road) would have been located closer to existing residents who had a poor perception of a sewage treatment facility being located so close to their homes due to the perceived impacts of traditional treatment facilities. By locating the proposal away from existing residential dwellings, the low impact of the proposal will be known before new landowners buy into the surrounding properties.

As the local water centre is scalable it allows treatment capacity to increase in line with the anticipated residential development and the volume of sewage to be treated. The reticulation system proposed for Cooranbong is a pressure sewer system which eliminates wet weather infiltration, thereby eliminating wet weather overflows of sewage to the environment and minimising the size of the local water centre required.

The sewage will be collected via a pressure sewerage system and pumped to the local water centre. The local water centre will employ membrane bioreactor technology complete with inlet screens, odour control, bioreactor, ultrafiltration membranes, ultraviolet disinfection, chlorination and reverse osmosis.

The local water centre is specifically designed to be located within a residential area by minimising noise and odour impacts. The noise and odour levels will be modelled as part of the local water centre's environmental assessment based on the proposed location and orientation and actual readings taken from similar facilities in other locations. The facility is architecturally designed and complemented with soft landscaping to blend in with the proposed local residential setting.

Q10 Has the planning proposal adequately addressed any social and economic effects?

The planning proposal has adequately addressed any social and economic effects.

The proposal will allow for the management of sewage from the entire North Cooranbong urban release area, with no off-site impacts. It makes a significant contribution to sustainability through the provision of refined water back to the residential area for toilet flushing, washing machines and irrigation and therefore satisfies the requirements of BASIX for potential homeowners.

As the local water centre is scalable it allows treatment capacity to increase in line with the anticipated residential development and the volume of sewage to be treated. The reticulation system proposed for Cooranbong is a pressure sewer system which eliminates wet weather infiltration, thereby eliminating wet weather overflows of sewage to the environment and minimising the size of the local water centre required.

The alternative(s) to the proposed Cooranbong Local Water Centre is to build a traditional local sewage treatment plant with discharge of a low quality effluent to the local waterway or, more expensively, to pipe the sewage to an existing sewage treatment plant for treatment and disposal, which would also require an amplification/upgrade of the existing receiving treatment plant and increase the existing discharge of effluent to the local waterway there. A gravity sewerage system would have a higher impact during construction, require sewage overflow points throughout the network and be subject to greater ingress of groundwater and stormwater thereby increasing the treatment capacity required.

These alternatives would be more expensive, take longer to implement, have greater potential environmental impacts, and fail to achieve sustainability initiatives for water re-use.

The incumbent water authority, Hunter Water, is not able to provide the flexibility, sustainability, innovation and cost savings to ensure the efficient and sustainable delivery of this important supply of housing stock. The private sector (Flow Systems Pty Ltd) has therefore been engaged to supply these services.

The utility infrastructure facility is to be funded by the Watagan Park development and therefore does not place unjustifiable economic burden on the greater community or Council.

The local water centre is designed to produce high quality refined water that is completely utilised by end users throughout the development and surrounding area. The refined water will be reticulated and plumbed into homes for toilet flushing, washing machines and domestic irrigation and reticulated to open space recreational areas and local customers for irrigation and potentially other uses. While irrigation and customer end uses are a function of the end

users available at the time that the refined water becomes available over the period of development, several areas have been identified such as temporary irrigation of future land release precincts and permanent subsurface irrigation of proposed open space recreation areas within the development as well as areas external to the development such as the Avondale College and Town Common areas.

SECTION D - STATE AND COMMONWEALTH INTERESTS

Q11 Is there adequate public infrastructure for the planning proposal?

A key aspect of the proposal is that it will provide the inclusion of SP2 Infrastructure zones, which will provide opportunities for the establishment of a sewerage treatment and water utility facility to service the whole North Cooranbong urban growth area; thus allowing for timely, flexible, efficient and economical delivery of the approved Concept Masterplan.

The incumbent water authority, Hunter Water, is not able to provide the flexibility, sustainability, innovation and cost savings to ensure the efficient and sustainable delivery of this important supply of housing stock. The private sector (Flow Systems Pty Ltd) has therefore been engaged to supply these services.

The utility infrastructure facility is to be funded by the Watagan Park development and therefore does not place unjustifiable economic burden on the greater community or Council. There will be no adverse affects placed on any other public infrastructure components of the North Cooranbong urban growth area.

Freemans Drive is suitable and has sufficient environmental capacity to support any additional residential lots associated with the proposed R2 Low Density Residential zone (Lot 12 DP 115808). Under the terms of the Planning Agreement with Council, Johnson Property Group are required to upgrade this central road connection to Freemans Drive and install traffic signals. The proposed central road connection, and the signalisation of this intersection, is not expected to affect the technical capability of the intersection as a result of the additional 40-odd residential lots created on Lot 12.

Q12 What are the views of State and Commonwealth public authorities, consulted in accordance with the gateway determination?

Consultation requirements directed by the Gateway determination will be followed.

SECTION E – ADDITIONAL MATTERS AS PER COUNCIL REQUEST

(Council letter to Development Director Johnson Property Group - Response to rezoning enquiry for 617 Freemans Drive Cooranbong - 28 April 2014)

1. Justification

- *The need for private water and wastewater services in the area.*

New residential development requires the co-ordinated provision of reticulated water and sewerage services. Whilst there is an approved servicing strategy with Hunter Water Corporation for the same 2500 North Cooranbong lots, it is a strategy that is not able to be delivered economically or in a timely manner. The alternative proposal, which is governed by an Act of parliament, is seen as the best option to manage sewage from the development as there are no off-site impacts. It makes a significant contribution to sustainability through the provision of refined water back to the residential homes for toilet flushing, washing machines and irrigation and therefore satisfies the requirements of BASIX for potential homeowners. As the local water centre is scalable it allows treatment capacity to increase in line with the anticipated residential development and the volume of sewage to be treated. The reticulation system proposed for Cooranbong is a pressure sewer system which eliminates wet weather infiltration, thereby eliminating wet weather overflows of sewage to the environment and minimising the size of the local water centre required.

The Hunter Water Corporation alternative to the proposed Cooranbong Local Water Centre is to build a traditional local sewage treatment plant with discharge of a low quality effluent to the local waterway or, more expensively, to pipe the sewage to an existing sewage treatment plant for treatment and disposal.. A gravity sewerage system would have a higher impact during construction, require sewage overflow points throughout the network and be subject to greater ingress of groundwater and stormwater thereby increasing the treatment capacity required. These alternatives would be more expensive, take longer to implement, have greater potential environmental impacts, and fail to achieve sustainability initiatives for water re-use.

The incumbent water authority, Hunter Water, is not able to provide the flexibility, sustainability, innovation and cost savings to ensure the efficient and sustainable delivery of this important supply of housing stock. The private sector (Flow Systems Pty Ltd) has therefore been engaged to supply these services.

- *An outline of the proposed servicing strategy for the site*

The proposal is to construct a standalone local water centre within the proposed development to collect all sewage via a pressure sewerage system and produce refined water to a high standard in accordance with the Australian Water Quality Guidelines. All of the refined water will then be reticulated and plumbed into the homes and to parks and other end users for use in toilets, washing machines and for irrigation.

Drinking water will be sourced from Hunter Water's mains and stored and reticulated throughout the development by Flow Systems.

- *The suitability of the proposed location of the private water and wastewater facilities and details of other sites considered*

The Cooranbong Local Water Centre option, delivered, operated and maintained by Flow Systems, was adopted by the developer as the preferred option due to limited off-site impacts, proximity to existing residents, proximity to HWC discharge points, its economic viability, and scalable platform allowing wastewater servicing to increase in line with the anticipated residential development and the volume of waste to be treated. It also makes a significant contribution to sustainability through the provision of refined water back to the residential area.

The location of the proposal was identified as a strategic location within the overall design of the residential subdivision. Other options considered (such as 60 Avondale Road) would have been located closer to existing residents who had a poor perception of a sewage treatment facility being located so close to their homes due to the perceived impacts of traditional

treatment facilities. By repositioning the proposal, the low impact of the proposal will be known before new landowners buy into the surrounding properties.

- *A summary of the proposed water and wastewater technology (photographs or drawings should be provided) and the proposed noise, visual and odour impacts. A summary of the proposed method of disposing of any excess wastewater should also be outlined. This includes the proposed location of any irrigation schemes associated with the proposed water recycling facility.*

The sewage will be collected via a pressure sewerage system and pumped to the local water centre. The local water centre will employ membrane bioreactor technology complete with inlet screens, odour control, bioreactor, ultrafiltration membranes, ultraviolet disinfection and reverse osmosis. The site will also contain storage for refined water produced by the local water centre to buffer supply and demand. The drinking water will be sourced from Hunter Water's mains, stored and pumped throughout the development under a Utility Services Agreement with Hunter Water.

The local water centre is specifically designed to be located within a residential area by minimising noise and odour impacts. The noise and odour levels will be modelled as part of the local water centre's environmental assessment based on the proposed location and orientation and actual readings taken from similar facilities in other locations. The facility is architecturally designed and complemented with soft landscaping to blend in with the proposed local residential setting. Noise and Odour assessments are being completed as part of the IPART application and can be provided to Council in support of this application on completion.

The local water centre is designed to produce high quality refined water that is completely utilised by end users throughout the development and surrounding area. The refined water will be reticulated and plumbed into homes for toilet flushing, washing machines and domestic irrigation and reticulated to open space recreational areas and local customers for irrigation and potentially other uses. While irrigation and customer end uses are a function of the end users available at the time that the refined water becomes available over the period of development, several areas have been identified such as temporary irrigation of future land release precincts and permanent subsurface irrigation of proposed open space recreation areas within the development as well as areas external to the development such as the Avondale College and Town Common areas. Discharge to HWC gravity sewer network is also being negotiated with HWC.

(Refer to Attachment 8 – Flow Systems recycling and water utility facility – Concept Drawings)

- *A preliminary analysis of potential traffic impacts from the residential component of the proposal*

Freemans Drive is generally suitable and has sufficient environmental capacity to support the additional residential lots. Under the terms of the Planning Agreement with Council, Johnson Property Group are required to upgrade this central road connection to Freemans Drive and install traffic signals. The proposed central road connection, and the signalisation of this intersection, is not expected to affect the technical capability of the intersection as a result of the additional 40-odd residential lots created on Lot 12.

- *An overall summary of the economic, environmental, social benefits and impacts of the proposal.*

For response, please refer to **Section C - Environmental, Social and Economic Impact** within this planning proposal.

2. State Environmental Planning Policies and (SEPPS) and S117 Directions

The proposed site includes class 3, 4 and 5 acid sulfate soils, remnant native vegetation (including endangered ecological communities), and is bushfire prone. The proposed site is also located adjacent to a natural watercourse and within a flood planning area. Part of the site is also identified as a sensitive aboriginal landscape. You should consider these matters when assessing the proposal's compliance against the relevant SEPPs and S117 Directions.

For response, please refer to questions 6 and 7 of **Section B - Relationship to Strategic Planning Framework** within this planning proposal.

3. Biodiversity matters

A preliminary analysis of the existing biodiversity values on the site, and the potential impacts resulting from the proposal, should be detailed. If applicable, a preliminary assessment of any proposed biodiversity offsets, in accordance with Council's 'Biodiversity Policy and Guidelines for (LEP) Rezoning Proposals', should be presented.

The land with the exception of the cleared parts associated with the existing dwelling (and edge areas) can be described as containing vegetation in good to moderate condition. Part of the site is identified as a narrow vegetation corridor (<200m) that links vegetation scattered throughout the rural residential allotments south of Freemans Drive with the Watagans National Park and Olney State Forest to the north (see **Figure 2**). The functionality of the vegetation corridor will be preserved to maintain the habitat and landscape connectivity.

A review of LMCC Vegetation Mapping (Stage 3) indicates that vegetation within the site is made up of a number of Coastal Plains Dry Sclerophyll Forests within the northern portion of the site grading into Coastal Swamp Forest EECs to the south. Only a small portion of the lot to the south is mapped as Coastal Swamp EEC and is **not proposed to be impacted upon** as a result of this proposal. Vegetation within the site is comprised of:

- MU30 Coastal Plains Smooth-barked Apple Woodland (0.8 ha)
- MU31 Coastal Plains Scribbly Gum Woodland (4.7 ha)
- MU37 Swamp Mahogany - Paperbark Forest (0.3 ha)
- MU42 Narrabeen Alluvial Sedge Woodland (0.4 ha)

A review of Atlas of NSW data indicates that there are no existing threatened flora and fauna records within the site. Within a 10km radius there have been a number of flora and fauna species recorded that would have the potential of occurring on site (see Table below)

A Biodiversity Study will be carried out in accordance with Councils 'Biodiversity Policy and Guidelines for (LEP) Rezoning Proposals'.

The outcome of the completed study will be used to determine if a biodiversity offset strategy is required.

Crinia tinnula	Wallum Froglet
Heleioporus australiacus	Giant Burrowing Frog

Mixophyes balbus	Stuttering Frog
Mixophyes iteratus	Giant Barred Frog
Pseudophryne australis	Red-crowned Toadlet
Litoria brevipalmata	Green-thighed Frog
Litoria littlejohni	Littlejohn's Tree Frog
Caretta caretta	Loggerhead Turtle
Chelonia mydas	Green Turtle
Hoplocephalus stephensii	Stephens' Banded Snake
Oxyura australis	Blue-billed Duck
Stictonetta naevosa	Freckled Duck
Ptilinopus regina	Rose-crowned Fruit-Dove
Ptilinopus superbus	Superb Fruit-Dove
Ephippiorhynchus asiaticus	Black-necked Stork
Ixobrychus flavicollis	Black Bittern
Erythrotriorchis radiatus	Red Goshawk
Hieraaetus morphnoides	Little Eagle
Lophoictinia isura	Square-tailed Kite
Pandion cristatus	Eastern Osprey
Burhinus grallarius	Bush Stone-curlew
Haematopus fuliginosus	Sooty Oystercatcher
Calidris ferruginea	Curlew Sandpiper
Callocephalon fimbriatum	Gang-gang Cockatoo
Calyptorhynchus lathami	Glossy Black-Cockatoo
Glossopsitta pusilla	Little Lorikeet
Lathamus discolor	Swift Parrot
Neophema pulchella	Turquoise Parrot
Ninox strenua	Powerful Owl
Tyto novaehollandiae	Masked Owl
Tyto tenebricosa	Sooty Owl
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)
Chthonicola sagittata	Speckled Warbler
Anthochaera phrygia	Regent Honeyeater
Epthianura albifrons	White-fronted Chat
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)
Daphoenositta chrysoptera	Varied Sittella
Petroica boodang	Scarlet Robin
Stagonopleura guttata	Diamond Firetail
Dasyurus maculatus	Spotted-tailed Quoll
Phascogale tapoatafa	Brush-tailed Phascogale
Phascolarctos cinereus	Koala
Petaurus australis	Yellow-bellied Glider
Petaurus norfolcensis	Squirrel Glider
Potorous tridactylus	Long-nosed Potoroo

Macropus parma	Parma Wallaby
Petrogale penicillata	Brush-tailed Rock-wallaby
Pteropus poliocephalus	Grey-headed Flying-fox
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat
Mormopterus norfolkensis	Eastern Freetail-bat
Chalinolobus dwyeri	Large-eared Pied Bat
Falsistrellus tasmaniensis	Eastern False Pipistrelle
Kerivoula papuensis	Golden-tipped Bat
Miniopterus australis	Little Bentwing-bat
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat
Myotis macropus	Southern Myotis
Scoteanax rueppellii	Greater Broad-nosed Bat
Vespadelus troughtoni	Eastern Cave Bat
Pseudomys novaehollandiae	New Holland Mouse

Rutidosis heterogama	Heath Wrinklewort
Tetratheca juncea	Black-eyed Susan
Acacia bynoeana	Bynoe's Wattle
Maundia triglochinoides	Maundia
Angophora inopina	Charmhaven Apple
Eucalyptus parramattensis subsp. parramattensis	Eucalyptus parramattensis C. Hall. subsp. parramattensis in Wyong and Lake Macquarie local government areas
Melaleuca biconvexa	Biconvex Paperbark
Syzygium paniculatum	Magenta Lilly Pilly
Cryptostylis hunteriana	Leafless Tongue Orchid
Persicaria elatior	Tall Knotweed
Grevillea parviflora subsp. parviflora	Small-flower Grevillea

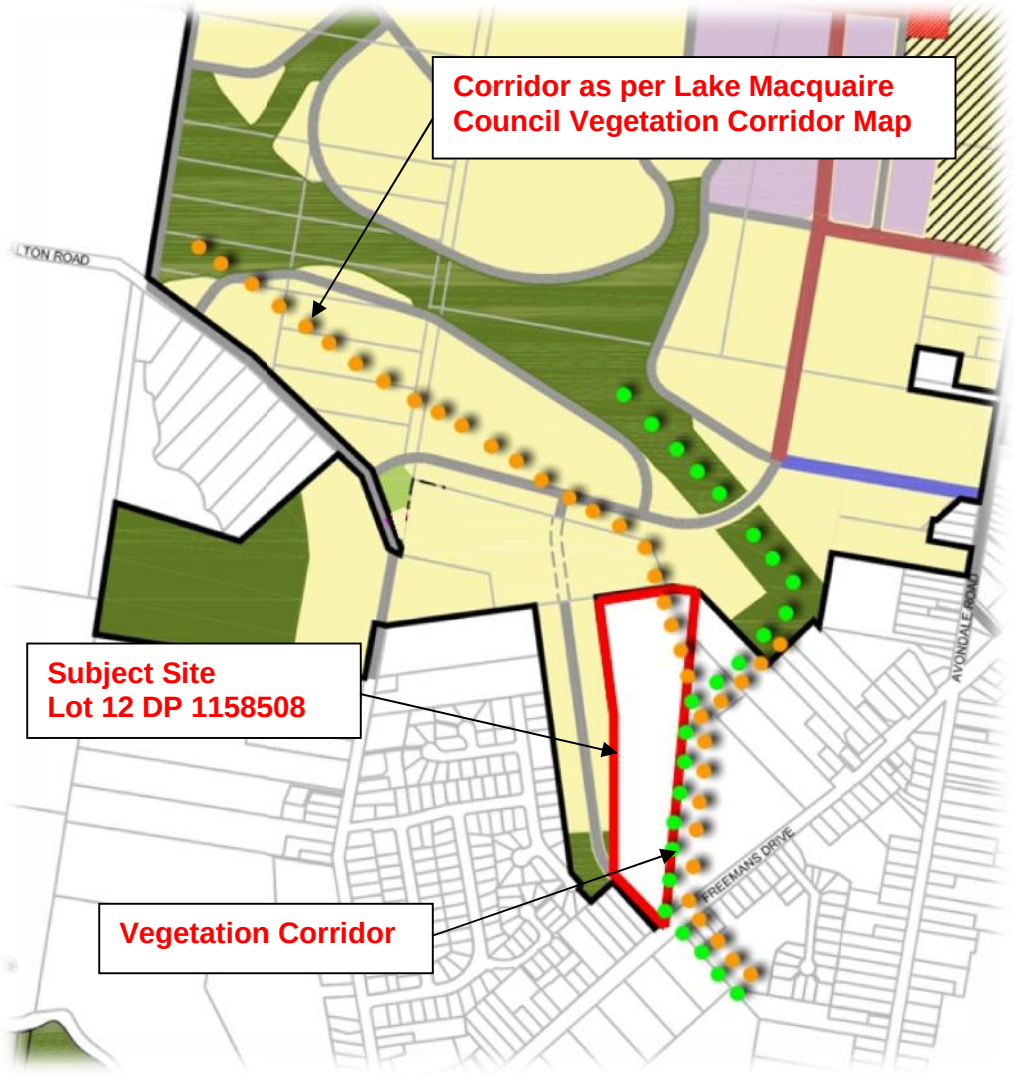


Figure 2: Vegetation Corridor Map

4. Past approvals and agreements

The proposal's consistency with past approvals or agreements relating to the North Cooranbong Residential Estate should be detailed. This includes consideration of concept plan approvals and voluntary planning agreements in relation to matters such as dedication of land, biodiversity offsets, and road infrastructure upgrades. Any potential modifications required to past approvals and agreements should also be detailed.

The proposed rezoning of Lot 1 DP 3533 represents a minor amendment to the approved Concept Masterplan which will enhance the use of the land by supporting the intent of the approved Concept Masterplan. The proposal represents a small reduction in the land available for residential development, however remains consistent with past approvals and agreements relating to the North Cooranbong Residential Estate in regards to matters such as dedication of land, biodiversity offsets, and road infrastructure upgrades

The proposed rezoning of Lot 12 DP 115808 represents a rezoning separate from the previously approved Concept Masterplan and as such may be considered a standalone rezoning.

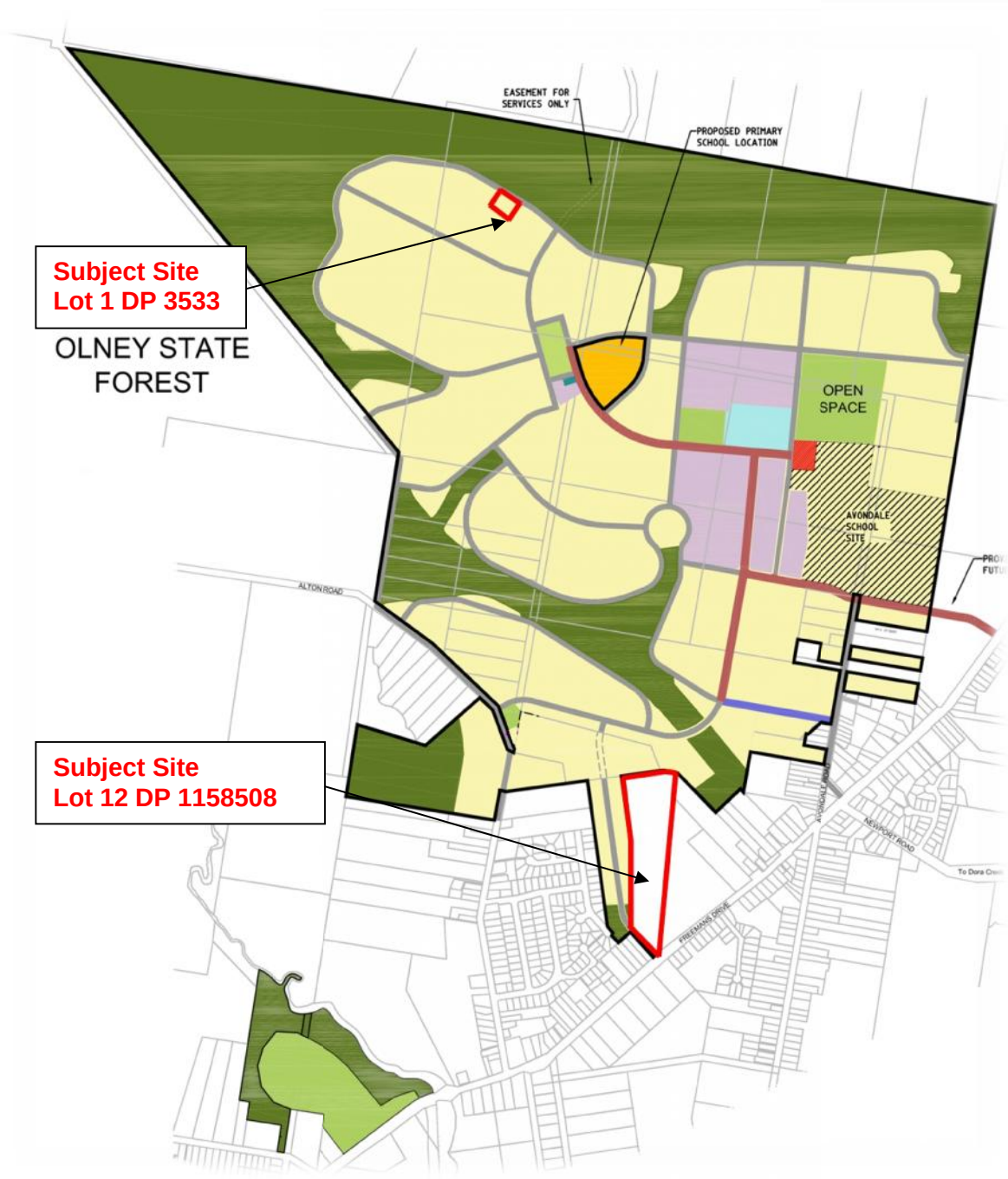
This proposal will allow for the logical extension of the North Cooranbong urban growth area to allow for a vital residential link between the existing Cooranbong settlement and the North Cooranbong urban release area. This provision will have the effect of further ensuring the synergy between the existing Cooranbong settlement and the North Cooranbong urban release area by introducing a populated, integrated path of development southwards from the North Cooranbong urban release area, which is currently non-existent. The introduction of an additional linking road through this integrated path will also further alleviate future traffic flows between the two.

The proposed Environmental Conservation Zone on flood affected land will offer a link in the wildlife corridor network for the area thus contributing to the successful environmental outcomes of the master plan. It is anticipated this area will be added to the other approximately 120ha of Environmental zone land within the estate and transferred with it to Lake Macquarie City Council for public ownership, subject to agreement by Council.

While the proposed rezoning of Lot 12 DP 115808 represents a rezoning separate from the previously approved Concept Masterplan, it will greatly enhance the overall functionality of the North Cooranbong Residential Estate, without impacting on past concept plan approvals and voluntary planning agreements in relation to matters such as dedication of land, biodiversity offsets, and road infrastructure upgrades.

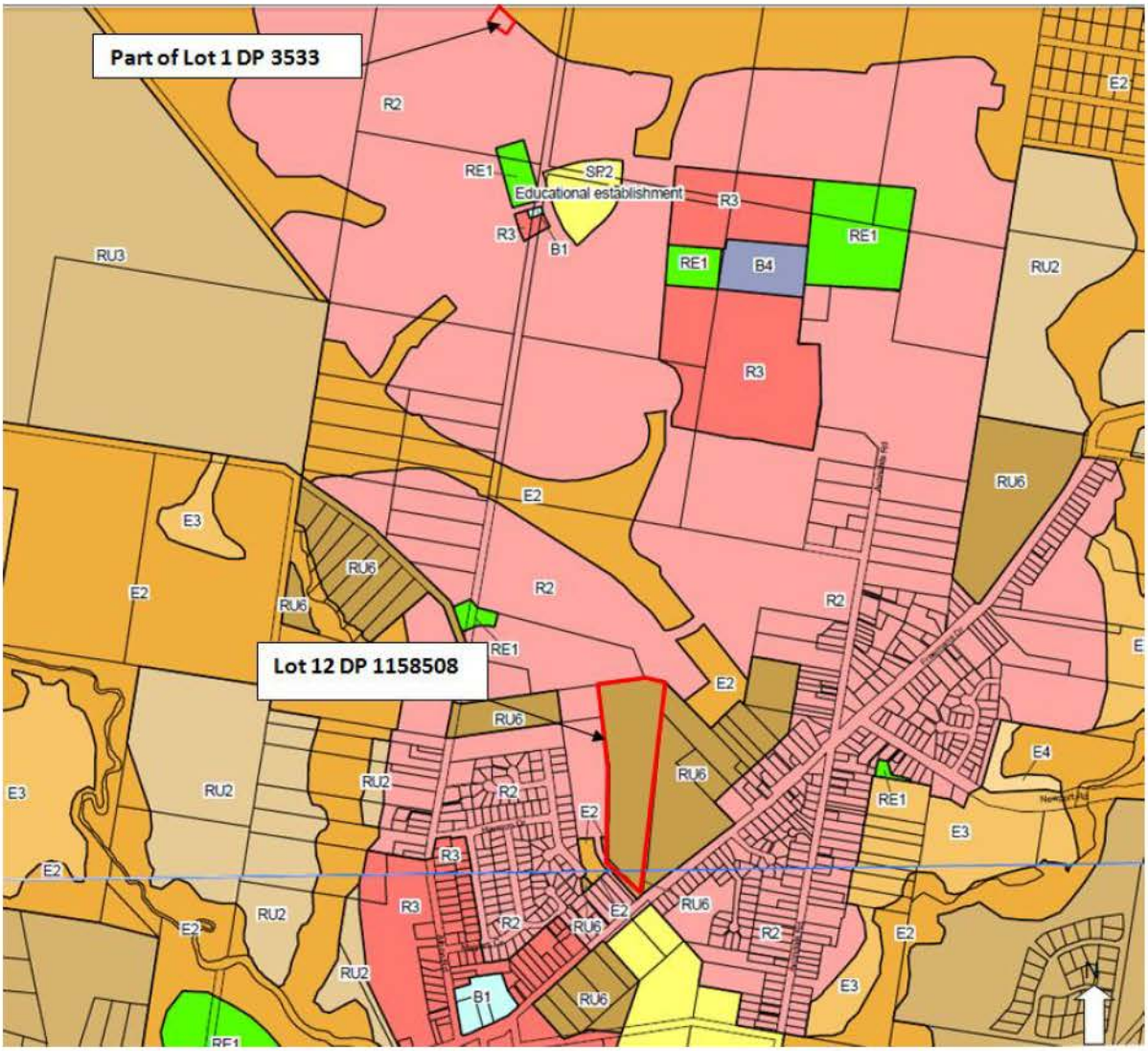
PART 4 MAPPING

Attachment 1- Site Locations on Current North Cooranbong Masterplan



Attachment 2 – Council's Proposed Zoning – Draft Lake Macquarie Local Environmental Plan 2014

Attachment 2 – Council's Proposed Zoning – Draft Lake Macquarie Local Environmental Plan 2014



Attachment 3 – Indicative Proposed Zoning Lot 12 DP 115808 – Amendment DRAFT Lake Macquarie LEP 2014

Attachment 4 – Indicative Proposed Zoning Lot 1 DP 3533 – Amendment DRAFT Lake Macquarie LEP 2014

SP2 - Infrastructure

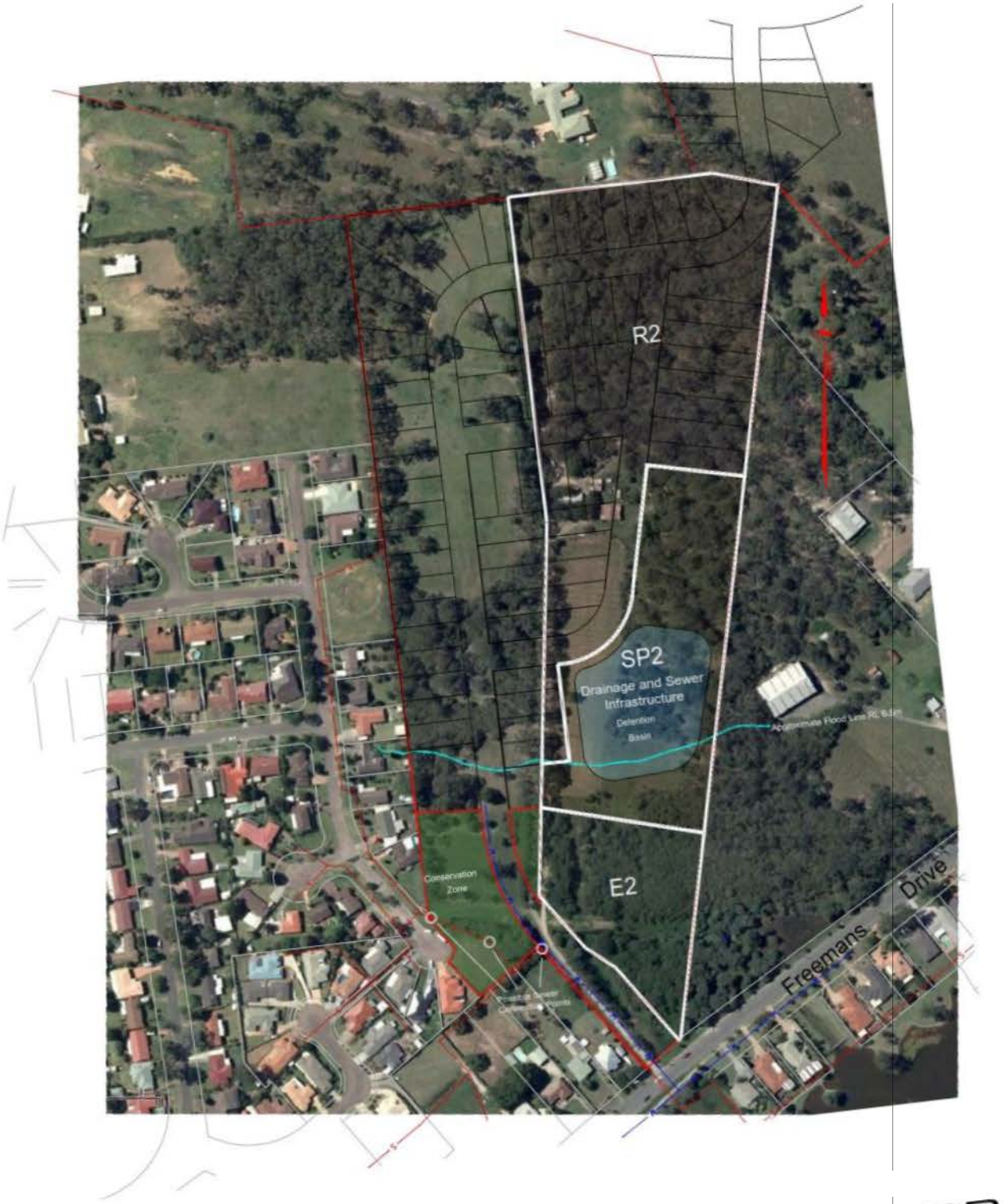
JOHNSON PROPERTY GROUP

Proposed Zoning
Part of Lot 1, DP 3533
Freemans Drive, Cooranbong

SHEET 2 of 2
02/05/2014
DRWN : AMC - Rev B
Scale - 1:4000 @ A3
PRZ - 1408 -101

HDB TownPlanning&Design

Attachment 5 – Proposed zoning and indicative layout - Lot 12 DP 115808



NOTE: ALL DIMENSIONS, AREAS, LOT NUMBERS EASEMENTS & NUMBER OF LOTS ARE SUBJECT TO THE APPROVAL OF COUNCIL & OTHER AUTHORITIES AND TO THE FINAL SURVEY & LINEN PLAN AND SHOULD BE CONSIDERED AS CONCEPTUAL ONLY. DO NOT RELY ON THE INFORMATION IN THIS PLAN APZ SETBACKS, FLOODING, DETENTION, FAUNA AND FLORA REQUIREMENTS - ARE ALL SUBJECT TO FURTHER STUDIES AND CHANGE.

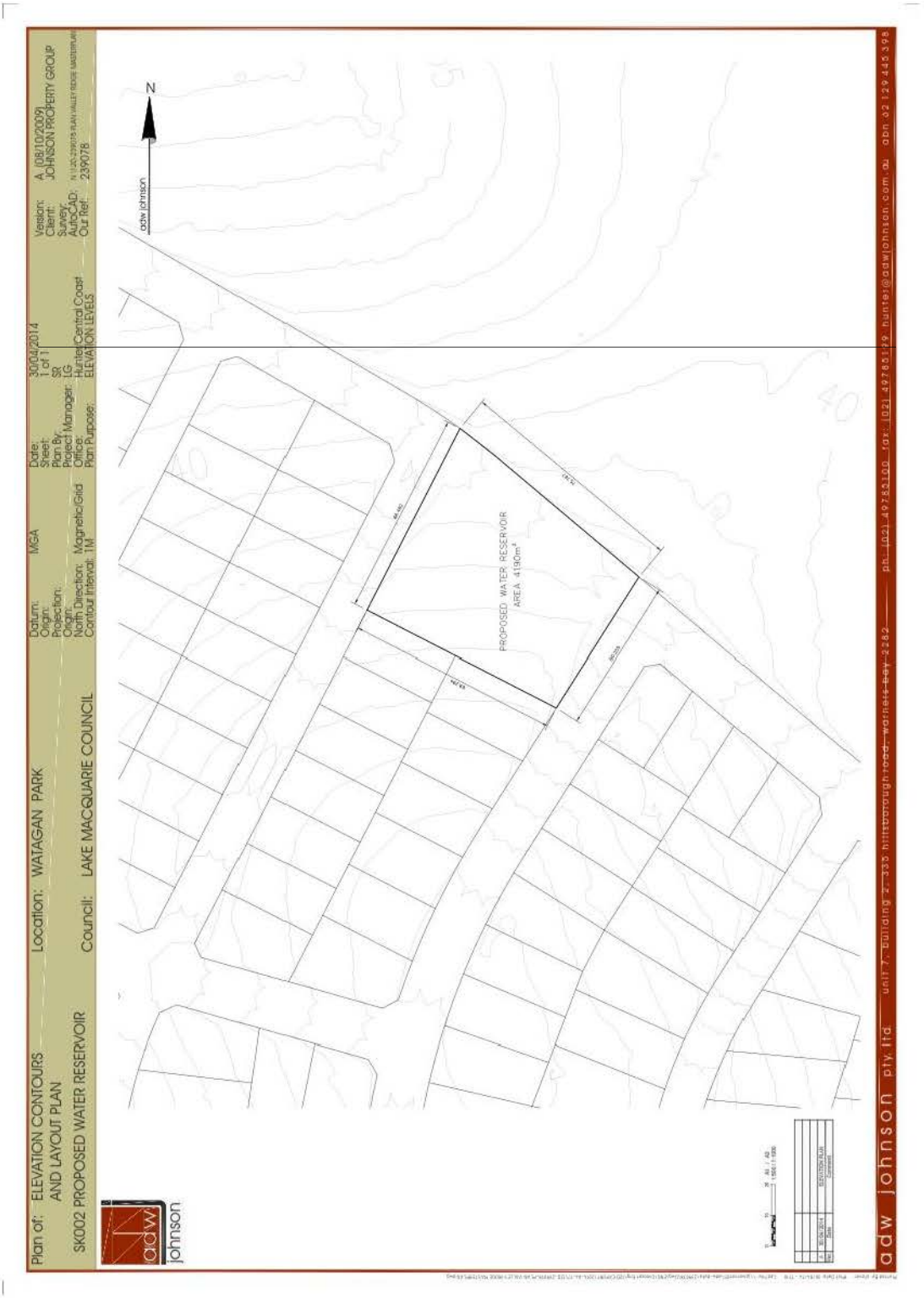
JOHNSON PROPERTY GROUP

Proposed Subdivision & Zoning
Lot 212 DP 1037011
Lot 1 DP 348173
Lot 11 DP 1158508
Lot 12 DP 1158508
Freemans Drive, Cooranbong

SK - 1252 -102
Scale - 1:500 @ A3
Date - 05/05/14

HDB TownPlanning&Design

Attachment 6 – Proposed zoning and indicative layout - Lot 1 DP 3533

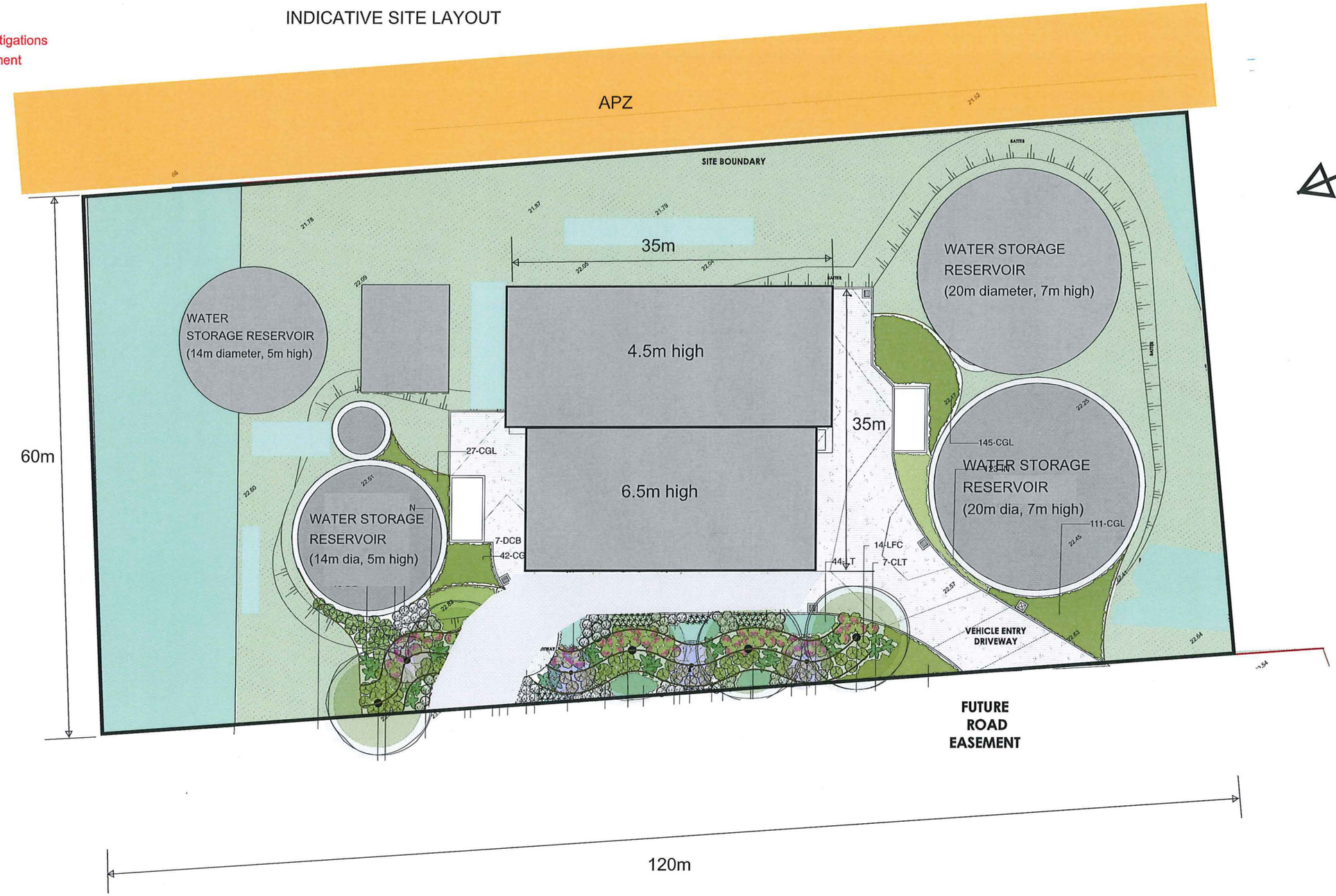


Attachment 7 – Site Ecology (desktop) - Lot 12 DP 115808

Attachment 8 – Flow Systems recycling and water utility facility – Concept Drawings

CONCEPT ONLY
Design subject to site investigations
and environmental assessment

INDICATIVE SITE LAYOUT



PART 5 DETAILS OF COMMUNITY CONSULTATION

Initial consultation with council has taken place. The planning proposal will be exhibited in accordance with the Gateway determination. This section will be updated once community consultation occurs.

PART 6 PROJECT TIMELINE

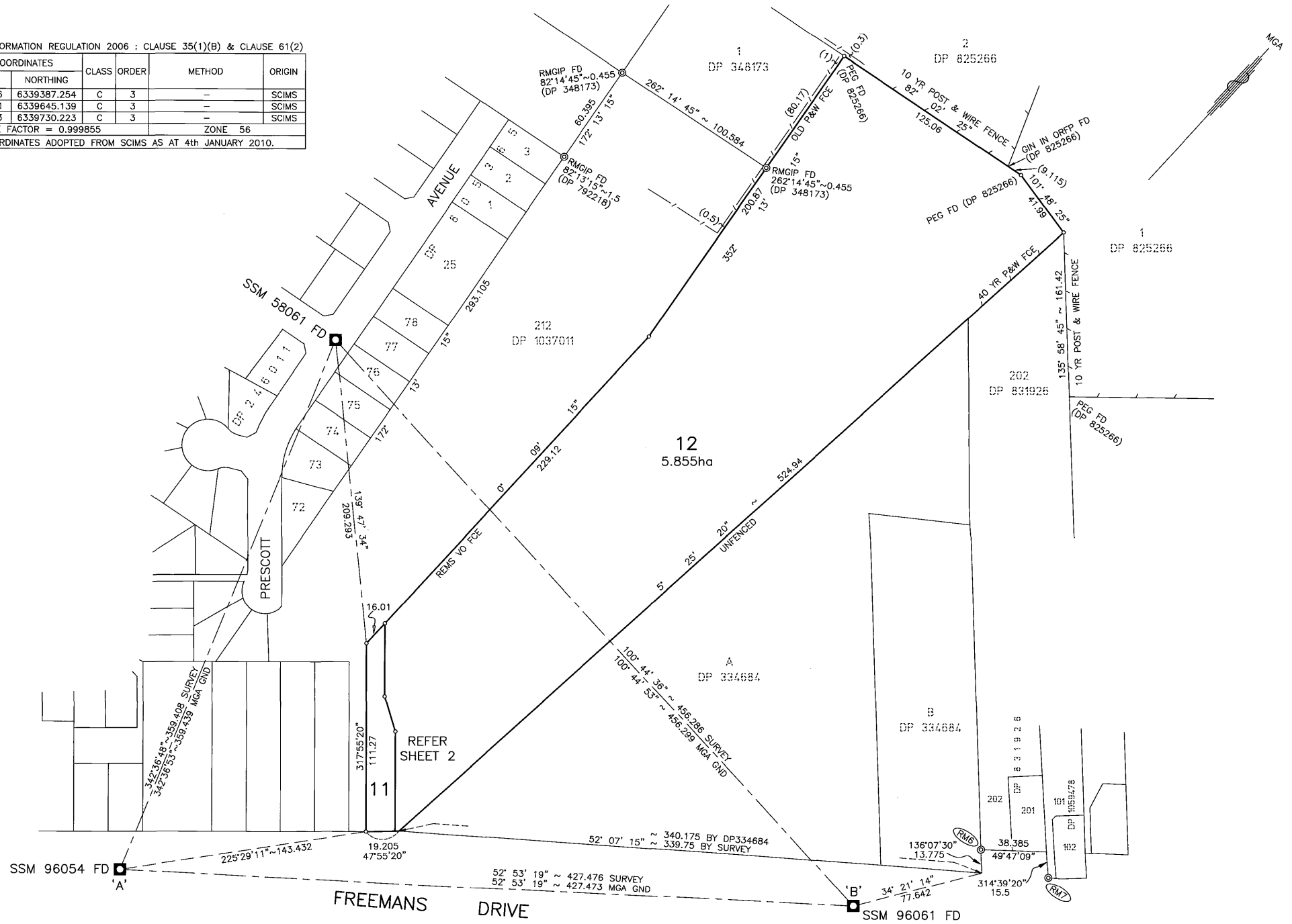
The project timeline is subject to the requirements of the Gateway Determination.

Appendix F

Deposited Plan 1158508

SURVEYING & SPACIAL INFORMATION REGULATION 2006 : CLAUSE 35(1)(B) & CLAUSE 61(2)

MARK	MGA COORDINATES		CLASS	ORDER	METHOD	ORIGIN
	EASTING	NORTHING				
SSM 96054	355972.826	6339387.254	C	3	–	SCIMS
SSM 96061	356313.671	6339645.139	C	3	–	SCIMS
SSM 58061	355865.443	6339730.223	C	3	–	SCIMS
COMBINED SCALE FACTOR = 0.999855					ZONE 56	
SOURCE : MGA COORDINATES ADOPTED FROM SCIMS AS AT 4th JANUARY 2010.						



Surveyor: DAVID CRAIG WALLACE Date of Survey: 4 JAN 2010 Surveyor's Ref: 07200DPD	PROPOSED PLAN OF ACQUISITION OF PART OF LOT 1 DP 120139	LGA: LAKE MACQUARIE Locality: COORANBONG Subdivision No: - Lengths are in metres. Reduction Ratio 1: 1500	Registered 12.11.2010	DP1158508 P

10 20 30 40 50 60 Table of mm 90 100 110 120 130 140

PUBLIC APPLICATION

Cooranbong Water

Appendix 3.5.1(d) Review of Environmental Factors for Sewage and Recycled Water Reticulation Systems

flow systems

REF for a Proposed Sewage and Recycled Water Reticulation System

Cooranbong, New South Wales

Prepared by:

RPS AUSTRALIA EAST PTY LTD

241 Denison Street
Broadmeadow NSW 2292
PO Box 428 Hamilton NSW 2303

T: +61 2 4940 4200
F: +61 2 4961 6794
E: newcastle@rpsgroup.com.au

Prepared for the proponent:

COORANBONG WATER (A WHOLLY OWNED SUBSIDIARY OF FLOW SYSTEMS PTY LTD)

Level 2, 1 Alfred Street
Sydney NSW, 2000

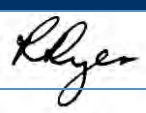
T: +61 2 8016 1021
E: dwharton@flowsystems.com.au

Client Manager: Rob Dwyer
Report Number: 125541
Version / Date: Version 3 / January 2015

Document Status

Version	Purpose of Document	Orig	Review	Review Date
Ver. 1	Submission to client	SS	RD	16.1.2015
Ver. 2	Final Draft	LV	SS	20.1.2015
Ver. 3	Final	LV	SS	21.1.2015

Approval for Issue

Name	Signature	Date
Rob Dwyer		21.1.2015

Terms and Abbreviations

Abbreviation	Meaning
AHIMS	Aboriginal Heritage Information System
AHIP	Aboriginal Heritage Impact Permit
BCA	*Building Code of Australia*
CEMP	Construction Environmental Management Plan
CLM Act	*Contaminated Land Management Act 1977*
DCP	Development Control Plan
EEC	Endangered Ecological Community
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999*
Flow Systems	Flow Systems Pty Ltd, the parent company of Cooranbong Water.
HDPE	High density polyethylene
HWC	Hunter Water Corporation
Cooranbong LWC	Cooranbong Local Water Centre
Cooranbong Water	A private water utility wholly owned by Flow Systems Pty Ltd and operator of the proposal.
IPART	Independent Pricing and Regulatory Tribunal
ISEPP	SEPP (Infrastructure) 2007
JPG	Johnson Property Group
LM LEP 2004	*Lake Macquarie Local Environmental Plan 2004*
LM LEP 2014	*Lake Macquarie Local Environmental Plan 2014*
LEP	Local Environment Plan
LGA	Local Government Area
LM LEP 2014	Lake Macquarie Local Environmental Plan 2014
LWC	Local Water Centre
NES	National Environmental Significance

NOW	NSW Office of Water
NPW Act	*National Parks and Wildlife Act 1977*
OEH	Office of Environment and Heritage
PBP	*Planning for Bushfire Protection 2006*
REF	Review of Environmental Factors
RMS	Roads and Maritime Services
SEPP	State Environmental Planning Policy
TSC Act	*NSW Threatened Species Conservation Act, 1995*
WRF	Water recycling facility
WICA	*Water Industry Competition Act 2006*

Contents

Tables

Figures

Appendices

1.0 Introduction

This Review of Environmental Factors (REF) has been prepared for a pressure sewage reticulation system and a recycled water reticulation system (the proposal) at Cooranbong. The sewage and recycled water reticulation systems will be operated by Cooranbong Water (a wholly owned subsidiary of Flow Systems) to facilitate residential development of the North Cooranbong Residential Precinct which is within the Lake Macquarie City local government area (LGA). The sewage and recycled water reticulation systems will be located on land controlled by Johnson Property Group Pty Ltd (JPG) servicing approximately 2,100 residential lots. The proposal will be operated and maintained by Cooranbong Water in-conjunction with the Cooranbong Local Water Centre (LWC) which is proposed to be located on Lot 12 DP 1158508. The Cooranbong LWC is the subject of separate approval from Lake Macquarie City Council (LMCC) (DA/714/2014).

This REF has been prepared for the construction and operation of a *sewage reticulation system* as defined in clause 105 of *State Environmental Planning Policy (Infrastructure) 2007* for the purposes of Clause 106(3)*:*

sewage reticulation system means a facility for the collection and transfer of sewage to a sewage treatment plant or water recycling facility for treatment, or transfer of the treated water for use or disposal, including associated:

(a) pipelines and tunnels, and

(b) pumping stations, and

(c) dosing facilities, and

(d) odour control works, and

(e) sewage overflow structures, and

(f) vent stacks.

By virtue of the reference to “transfer of the treated water for use or disposal”, this also includes the recycled water reticulation system.

The development of the sewage reticulation system is an activity under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).This REF has been prepared to provide the Independent Pricing and Regulatory Tribunal (IPART) and the NSW Minister for Natural Resources, Lands and Water with information to the fullest extent possible of all matters affecting, or likely to affect, the environment by the construction and operation of the proposal. Sections 111 and 112 of the EP&A Act and Clause 228 of the EPA Regulations identify the factors required to be taken into account by a determining authority when assessing the environmental impact of an activity. Section 6 and **Appendix 1** of this REF provides an assessment of the environmental issues associated with the proposal, in line with these requirements and also those matters of National Environmental Significance under Commonwealth legislation.

This REF has also been prepared with due regard for the licensing criteria, principles and environmental clauses in the *Water Industry Competition Act 2006* (WICA), particularly section 7(1)(a) and the *Water Industry Competition (General) Regulation 2008*, particularly section 7.

1.1 Background

The NSW Government introduced the *Water Industry Competition Act 2006* (WICA) as part of its strategy for a sustainable water future to harness the innovation and investment potential of the private sector in the water and wastewater industries. WICA established a licensing regime for new entrants to the industry to ensure the continued protection of public health, consumers and the environment. The private sector is now encouraged to develop and operate water management schemes and the licensing system is governed by IPART.

The North Cooranbong Residential Precinct is identified in the *Lower Hunter Regional Strategy 2006* as a major release area. The North Cooranbong Residential Precinct is zoned for urban development under *Lake Macquarie Local Environmental Plan 2014* (LM LEP 2014) and has Concept Approval (MP 07-0147) for up to 2,250 dwellings. Additionally a Voluntary Planning Agreement has been executed to secure environmental conservation lands and monetary contributions to offset ecological impacts.

Subsequent to the Concept Approval referenced above, JPG applied to Lake Macquarie City Council to re-zone Lot 12 DP 1158508 for residential development. The proposed sewage and recycled water reticulation network also extends into this area.

An environmental assessment in support of the Concept Approval Application for the North Cooranbong Residential Precinct and the Planning Proposal for the rezoning of Lot 12 DP 1158508 was prepared by JPG. The Assessment established the main environmental factors for the area to be rezoned and for the current development site within that area. The conclusion of the Assessments was the area studied was suitable for a range of uses namely, part residential, part commercial/retail, part environmental conservation, and part open space. The sewage and recycled water reticulation system will be located within the approved development footprint of Concept Approval (MP 07-0147) and Lot 12 DP 1158508.

The development stages known as Stages 1A to 1D1 off Avondale Road (99 residential lots) and the precinct known as Jackson off Alton Road (18 residential lots) have already been developed and are therefore excluded from the scope of this REF.

The development stages known as Stages 1E to 1H (81 residential lots) have received development consent from Lake Macquarie City Council under Part 4 of the EP&A Act (DA/573/2014).

1.2 Location and Description of Existing Environment

A plan showing the location of the proposal subject of this REF is shown in **Figure 1**. Concept master plans for the sewage reticulation system and the recycled water reticulation system are contained in **Appendix 2** and **Appendix 3** respectively. A plan showing the residential and street layout of Concept Approval (MP 07-0147) is shown within **Figure 2**. Comparison of the concept master plans referred to above with **Figure 2** clearly indicates the proposals' confinement to the approved development footprints of Concept Approval (MP 07-0147). The proposal also includes the sewage and recycled water reticulation system within part Lot 12 DP 1158508.

The site is located to the north of the existing Cooranbong village and adjoins existing residential areas of the Cooranbong suburb. The site can be described as vacant farming land containing grass vegetation and scattered trees. The landscape has been previously modified to some degree by vegetation clearing.

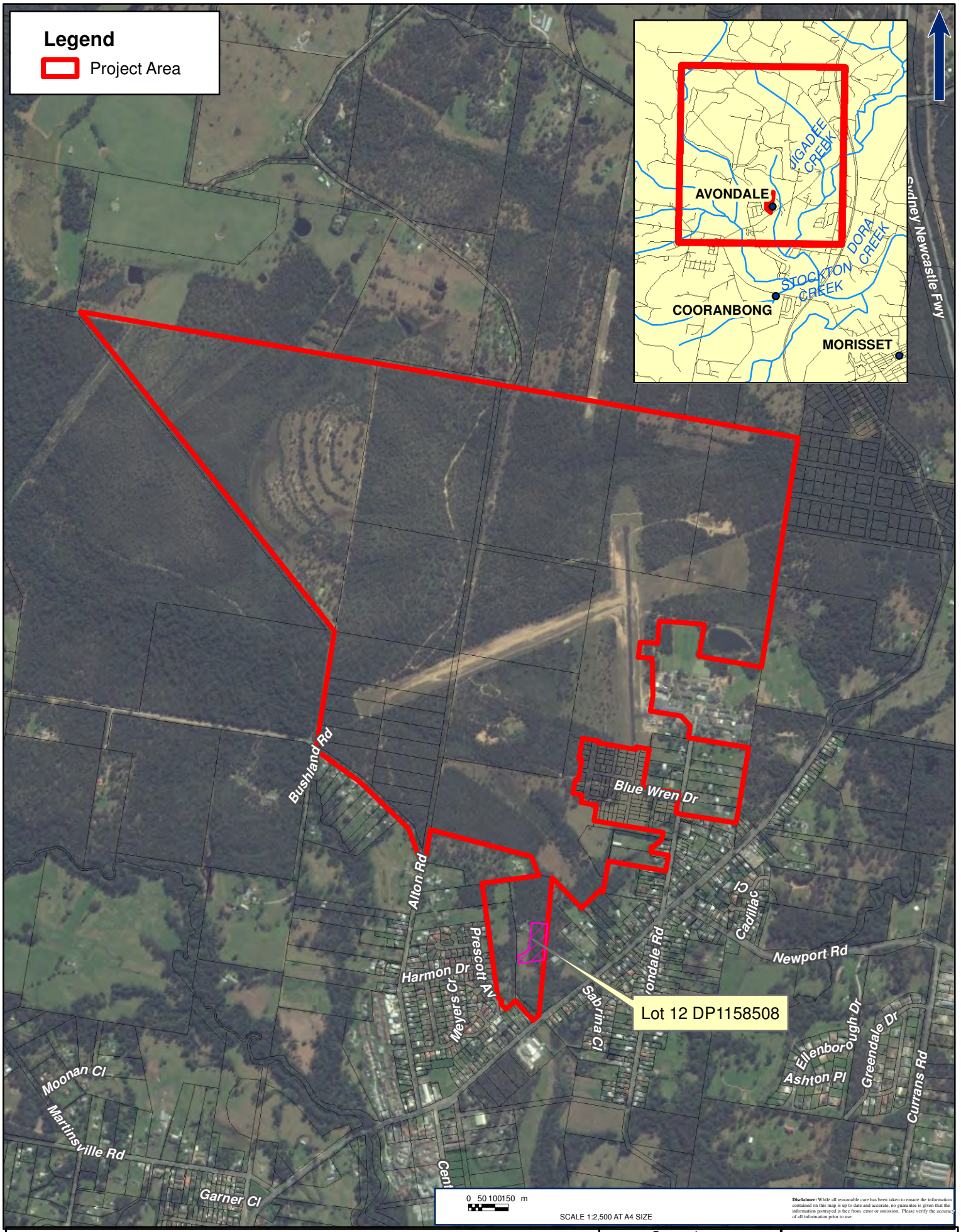


Figure 1: Project Site Location

LOCATION: Cooranbong	DATUM: GDA94 PROJECTION: MGA Zone 56
JOB NO.: **PR125541-1** PURPOSE: PLANNING Technician: Sean.Avery Date: 16/01/2015	Data Sources: Client Supplied

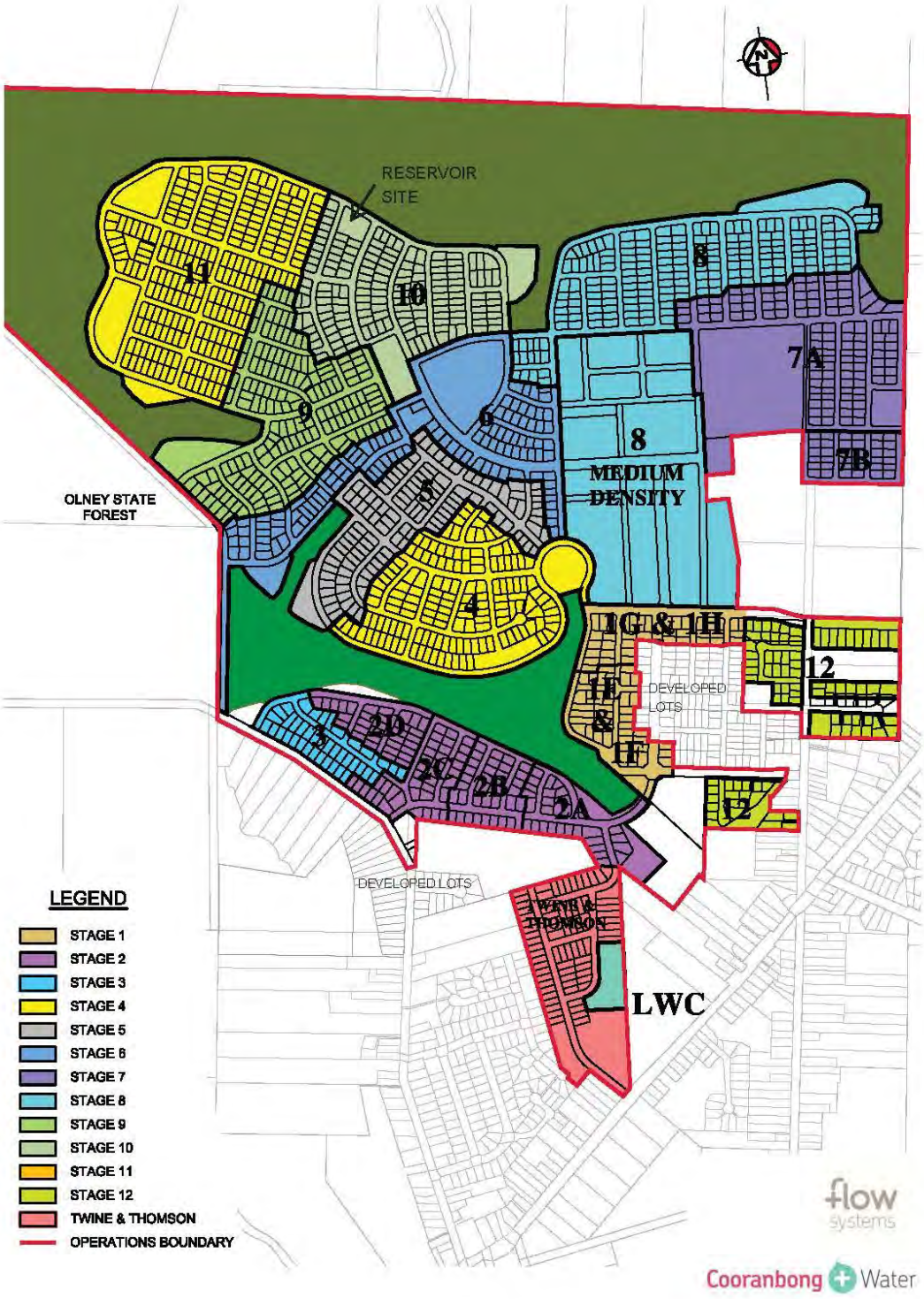
CLIENT: Flow Systems Pty Ltd

RPS AUSTRALIA EAST PTY LTD (ABN 44 140 292 762)
241 DENISON STREET BROADMEADOW PO BOX 428 HAMILTON NSW 2303
T: 02 4940 4200 F: 02 4961 6794 www.rpsgroup.com.au

RPS

Path: J:\JOBS\125k\125541 North Cooranbong\03 - Planning\125541-1 Figure 1_Location 1 A A4.mxd

Figure 2 Concept Approval (MP 07-0147) Area



2.0 Needs and Options considered

2.1 Strategic Need for the Proposal

As with all urban release areas wastewater capacity and solutions for disposal are essential.

2.2 Proposal Objectives

The objective of the proposal is to provide sewage and recycled water reticulation systems that will:

- Contribute to the efficient provision of essential infrastructure required to service a new residential community;
- Be undertaken without an adverse impact on the environment; and
- Be provided in accordance with existing Government Policy.

2.3 Alternatives and Options Considered

New residential development requires the co-ordinated provision of sewage and recycled water reticulation systems. The proposal and the development of the Cooranbong LWC (under separate approval) is seen as the best alternative type of system because the off-site impacts are limited.

Developer-funded water supply and wastewater servicing strategies were approved by the Hunter Water Corporation (HWC) for the North Cooranbong Residential Precinct. Various servicing options were considered including the transfer of wastewater flows to an existing Wastewater Treatment Plant (WWTP) in HWC's area of operation to the east of the land subject of the REF. These strategies have been revised based upon the revised demands from the option proposed.

Another alternative(s) to the proposal and the Cooranbong LWC is to build a traditional local sewage treatment plant with potential discharge to the local waterway. Either alternative would be more expensive, take longer to implement, have greater potential environmental impacts, and fail to achieve sustainability initiatives for water re-use.

2.4 Preferred Option

The pressure sewage and recycled water reticulation system as well as the establishment of the Cooranbong LWC, delivered, operated and maintained by Cooranbong Water, was adopted by JPG as the preferred option due to limited off-site impacts and economic viability. It also makes a significant contribution to sustainability through the provision of recycled water back to the planned residential areas.

The location of the proposal is within the approved development footprint of Concept Approval (MP 07-0147) and Lot 12 DP 1158508. The environmental qualities of the land have been assessed under Concept Approval (MP 07-0147) and impacts on the environment as well as mitigation measures to reduce impacts, including measures to offset ecological impacts, have been documented in the approved concept approval. Given the essential need for this infrastructure, the type and location of the proposal is assessed as providing the community with the best outcome in terms of type, operation and location.

3.0 Description of Proposal

3.1 Introduction

The proposal involves the installation and operation of a pressure sewage reticulation system within the entire JPG controlled lands (various) of the North Cooranbong Residential Precinct not already serviced by Hunter Water's gravity sewerage system. The proposal also includes the installation and operation of a recycled water reticulation system throughout the same area delivering high quality recycled water (non-potable uses such as toilet flushing, washing machines, irrigation and car washing) back to the new residential areas. The two systems will ultimately service around 2,100 residential lots.

A plan showing the location of the proposal subject of this REF is shown in **Figure 1**.

3.2 Proposed Pressure Sewage Reticulation System

A concept masterplan for the pressure sewage reticulation system is contained in **Appendix 2**. The plan shows the installation of pressure sewer mains throughout the approved development footprint of Concept Approval (MP 07-0147) and Lot 12 DP 1158508 with all mains located within the proposed street system associated with the approved development footprint.

Traditional sewer infrastructure in Australia is transported by gravity. Pressure sewer networks require much smaller infrastructure than traditional gravity sewers and because it doesn't have to be laid to grade like gravity sewer, it can be laid at shallower depths. Access chambers and pump stations that typically make up part of the gravity sewer network are not required and pre-fabricated wastewater collection tanks with proprietary pumps can be easily installed. Because of this, pressure sewer is suited to difficult ground conditions, such as rock and high water tables. Construction is faster and has less impact. Smaller infrastructure also means it is more easily repaired in the instance of a fault or emergency.

Pipe sizes for the pressure sewer mains vary from 50 mm to 125mm and will be industry standard thick-walled high density polyethylene (HDPE) pipes with fusion welded joints. This pipe material, jointing method and the pressurised nature of the system means that leaks are less likely than in traditional gravity sewer systems which are typically joined with rubber seals, which can deteriorate over time and attract tree roots. The HDPE pressure sewer pipes are designed to have the same life expectancy as a typical domestic building, which is 50 years.

As the pressure sewer system does not attract inflow and infiltration from stormwater and groundwater (as gravity sewer does), sewage overflow points in the system are not required. In addition, collection and treatment works can be reduced in capacity and footprint, thereby reducing their impact.

Typically the pipes will be located 600 to 900 mm below the street surface and laid via traditional trenching methods with some isolated sections requiring trenchless installation techniques. The system is linked to a series of isolation valves, air valves and flushing points located in regular intervals along the sewer main routes depending upon topography.

3.3 Proposed Recycled Water Reticulation System

A concept masterplan for the recycled water reticulation system is contained in **Appendix 3**. The plan shows the installation of mains throughout the approved development footprint of Concept Approval (MP 07-0147) and Lot 12 DP 1158508 with all mains located within the proposed street system associated with the approved development footprint.

The pipe sizes for the recycled water mains are 100mm and 250mm and

Typically the pipes will be 600 to 900 mm below the street surface and laid via traditional trenching methods with some isolated sections requiring trenchless installation techniques. The system is linked to a series of isolation valves, hydrants, air valves and flushing points located in regular intervals along the pipeline routes depending upon topography.

3.4 Outline of Construction Works

Construction of the sewage and recycled water reticulation systems will be staged in accordance with the indicative development stages envisaged by JPG which are illustrated on the concept master plan for the pressure sewage reticulation system contained in **Appendix 2**. Works within each development stage will be synchronised with the construction of the residential allotments within the stage and the associated street, drainage and other services infrastructure.

The site will be accessed via a sealed road as approved by the subdivision process for land in the southern portion of the North Cooranbong Residential Precinct. As each development stage is approved and constructed access to the site will be via the previous stage street network. Clearing and trenching will be confined to a four (4) metre corridor overlying the route selected in the concept master plan for the pressure sewage reticulation system and the recycled water reticulation system contained in **Appendix 2** and **Appendix 3** respectively.

Spoil from the construction of the infrastructure is expected to be minimal due to the relatively small size of pipe and shallow depth and will be managed in accordance with a Construction and Environmental Management Plan (CEMP) for the proposal. Temporary stock piles of spoil are expected to be minimal and will be placed within the extent of the works corridor and appropriate erosion control devices installed around the stock piles to control runoff and prevent sedimentation. Temporary sidetracks outside the area of disturbance are unlikely to be required for the proposed activity due to the nomination of the 4 metre wide corridor for pipe laying works which is sufficient for all construction works, associated construction vehicle movements and temporary vehicle parking and site facilities.

3.5 Construction Plant and Equipment

The following plant and equipment would be required to undertake the proposed works:

- Ditch Digger / Chainsaws / Mulcher;
- Small tipper trucks;
- Rigid delivery trucks;
- Excavator;
- Portable generators;
- General construction tools; and occasionally
- Bedbore machines and horizontal directional drills.

3.6 Construction Workforce

It is anticipated that the construction works for each of the development stages would be undertaken by a work crew of 5 – 6 people over a two-month period. All contractors and machine operators will be inducted on the environmental sensitivities of the work and relevant safeguards.

3.7 Construction Hours

The proposal will be constructed during the following hours:

- Monday to Friday 7am to 6pm; and
- Sunday 8am to 1pm.

3.8 Construction Program

Works for each of the development stages are expected to take two months per stage, commencing in the second quarter of 2015.

3.9 Environmental Management Plan – Construction Phase Activities

During construction, environmental safeguards referred to in this REF shall be implemented. The contractor shall prepare a CEMP covering the construction phase prior to the commencement of construction.

3.10 Outline of Operation Works

The operation of the proposal will be undertaken by Cooranbong Water (parent company being Flow Systems Pty Ltd) on the systems will operate 24 hours a day, 7 days per week.

4.0 Key Legislation

4.1 Environmental Planning and Assessment Act 1979

The EP&A Act establishes the statutory framework for planning and environmental assessment in New South Wales. Implementation of the EP&A Act is the responsibility of the Minister for Planning, statutory authorities and local councils. The EP&A Act contains two parts which impose requirements for planning approval, namely:

- Part 4 generally provides for the control of local development that requires development consent from the local Council. Part 4 now also provides for State Significant Development; and
- Part 5 provides for the control of 'activities' that do not require development consent under Part 4 and are undertaken or approved by approved authorities.

The applicable approval process is generally determined by reference to the relevant environmental planning instruments and other controls. These include local environmental plans (LEPs) and State Environmental Planning Policies (SEPPs). Pursuant to Section 36 of the EP&A Act there is a general presumption that a SEPP prevails over a LEP in the event of an inconsistency.

This REF has been prepared for the construction and operation of a *sewage reticulation system* as defined for the purposes of Clause 106(3) of *State Environmental Planning Policy (Infrastructure) 2007* which is an activity under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

4.2 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) requires the approval of the Commonwealth Minister for the Environment and Heritage for actions that may have a significant impact on matters of National Environmental Significance (NES). The Matters of NES under this Act are:

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

The REF has assessed the above matters with respect to the proposal as contained in **Appendix 1** and it is concluded that the proposal will not result in a significant impact on any matters of NES and, as such, does not require a referral to the Minister for the Environment and Heritage.

Two EPBC referrals have been lodged by the developer (as the proponent) for the wider Cooranbong North development. This includes a referral for Lot 12 DP 1158508 (2014/7315) and a referral for the remainder of the Cooranbong North residential development (2007/3828).

4.3 State Environmental Planning Policies

4.3.1 State Environmental Planning Policy (Major Development) 2005

The *State Environmental Planning Policy* (SEPP) (Major Development) Amendment 2008 (North Cooranbong) was published in the Government Gazette on 5 December 2008.

The Amendment, as part of the Part 3A Concept Approval for the North Cooranbong Residential Precinct, under the then *Lake Macquarie Local Environmental Plan 2004* (LM LEP 2004), rezoned land to the north and west of Cooranbong to a mix of 2(1) Residential, 2(2) Residential (Urban Living), 3(2) Urban Centre (Support), 5 Infrastructure, 6(1) Open Space, 7(1) Conservation (Primary) and 10 Investigation (Urban Conservation) zones. The area is now zoned to a mix of similar uses under LM LEP 2014. A zoning plan extract from the LM LEP 2014 is contained in **Figure 3**.

The zonings in LM LEP 2014 and the Part 3A Concept Approval (as modified) provide for:

- Up to 3,000 dwellings in residential zones covering up to 201 hectares;
- 2.75 ha for commercial development;
- 17.70 ha hectares for schools (existing and proposed);
- 15.25 ha for public open space / recreation and community facilities; and
- 119.13 ha for environmental protection.

4.3.2 State Environmental Planning Policy (Infrastructure) 2007

The *SEPP (Infrastructure) 2007* (ISEPP) provides a planning regime for infrastructure and the provision of services across NSW, along with providing for consultation with relevant public authorities during the assessment process. The ISEPP supports greater flexibility in the location of infrastructure and service facilities along with improved regulatory certainty and efficiency. The following clause of the ISEPP is applicable to the construction and operation of the proposal.

106 Development permitted with or without consent

Clause 106 of the ISEPP addresses development permitted with or without consent. Subclause (3) states the following:

(3) Development for the purpose of sewage reticulation systems may be carried out:

(a) *by or on behalf of a public authority or any person licensed under the* Water Industry Competition Act 2006 *without consent on any land, and*

(b) *(b) by any other person with consent on any land.*

However, such development may be carried out on land reserved under the National Parks and Wildlife Act 1974 only if the development is authorised by or under that Act.

The Minister for Natural Resources, Land and Water is required to consider a REF for sewage reticulation systems under Part 5 of the EP&A Act. The operation of the proposal will be undertaken by Cooranbong Water who will be licensed under the WICA. The land is not reserved under the *National Parks and Wildlife Act 1974*.

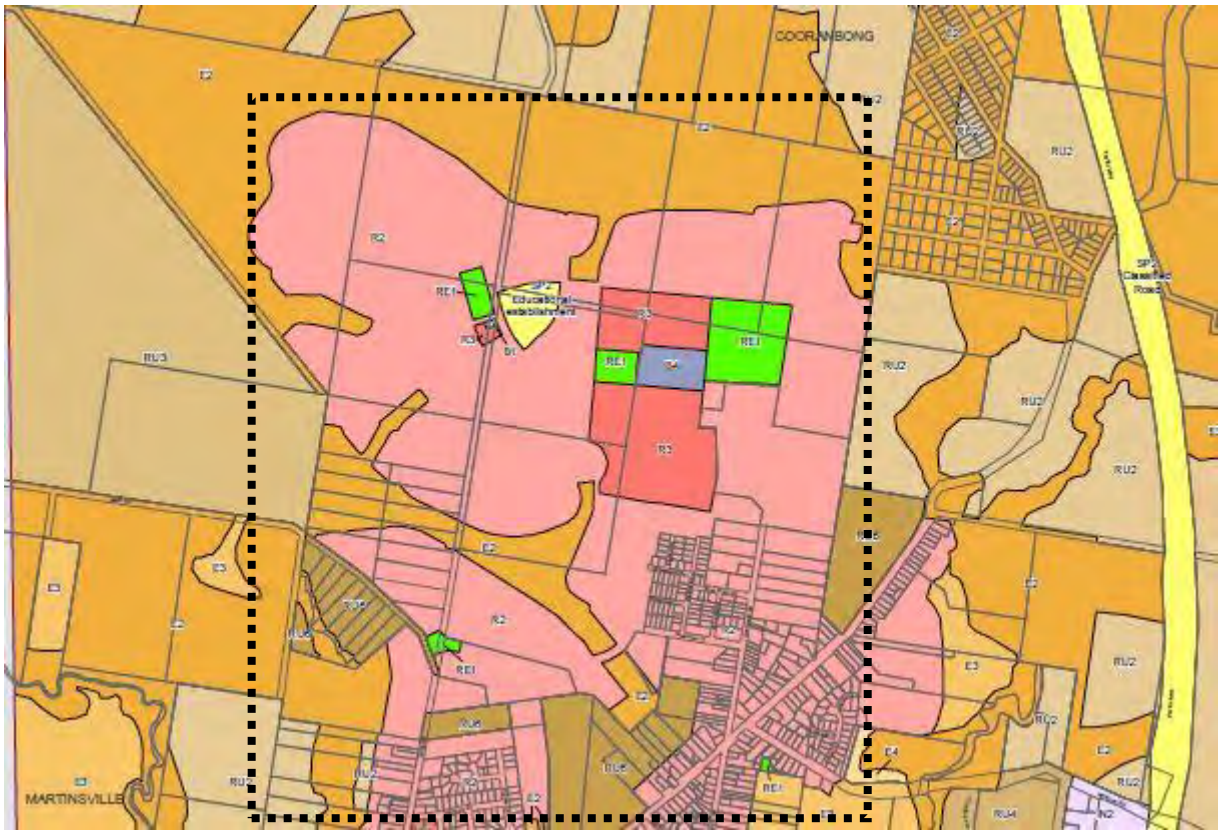
4.4 Local Planning Policies

4.4.1 Lake Macquarie Local Environmental Plan 2014

LM LEP 2014 is a legal document that provides rules and guidelines for development within the Lake Macquarie LGA to control the use of private and public land through zoning. The provisions of an LEP do need to be considered for development assessed under Part 5 of the EP&A Act. As can be seen in **Figure 3** the site is zoned a mix of R2 Low Density Residential, R3 Medium Density Residential, B4 Mixed Use, E2 Environmental Conservation and RE 1 Public Recreation.

RZ-3-2014 proposes an amendment to LM LEP 2014 to re-zone Lot 12 DP 1158508 to a mixture of R2 Low Density Residential, E2 Environmental Conservation and SP2 Infrastructure.

Figure 3 Land Zoning Map



Source: Lake Macquarie LEP 2014 (dotted line represents approximate extent of North Cooranbong Residential Precinct

Zone
B1 Neighbourhood Centre
B2 Local Centre
B3 Commercial Core
B4 Mixed Use
B7 Business Park
E1 National Parks and Nature Reserves
E2 Environmental Conservation
E3 Environmental Management
E4 Environmental Living
IN1 General Industrial
IN2 Light Industrial
IN4 Working Waterfront
R1 General Residential
R2 Low Density Residential
R3 Medium Density Residential
RE1 Public Recreation
RE2 Private Recreation
RU2 Rural Landscape
RU3 Forestry
RU4 Rural Small Holdings
RU6 Transition
SP1 Special Activities
SP2 Infrastructure
SP3 Tourist
W1 Natural Waterways
DM Deferred matters

4.4.2 Lake Macquarie Development Control Plans

The Lake Macquarie Development Control Plan 2014 is a support document for the LM LEP 2014. It provides guidance and detailed development requirements for activities within zones and localities. The document does not have specific requirements for sewage reticulation systems however they do contain general provisions which, where relevant, have been considered in the design of the proposal.

4.5 Other Legislative Requirements

Other state legislation relevant to the assessment of environmental impacts of the proposal has been considered and are outlined below.

Water Management Act 2000

The *Water Management Act 2000* is administered by the NSW Office of Water (NOW). The objective of this Act is to protect watercourses from any deleterious effects as a result of works within or near such watercourses. Part 3A of the Act requires any persons undertaking works within 40 metres of a watercourse to obtain a permit. The proposal does not require a "Controlled Activity Approval" under the *Water Management Act 2000* due to the works being located more than 40 metres from a watercourse.

Water Industry Competition Act 2006 and Water Industry Competition (General) Regulation 2008

WICA, as part of its strategy for a sustainable water future aims to harness the innovation and investment potential of the private sector in the water and wastewater industries. WICA established a licensing regime for new entrants to the industry to ensure the continued protection of public health, consumers and the environment. The private sector is now encouraged to develop and operate water management schemes and the licensing system is governed by IPART and the Minister for Natural Resources, Lands and Water. As mentioned in Section 3 of this REF the operation of the sewage reticulation system will be undertaken by Cooranbong Water who will be licensed under the WICA.

IPART assesses WICA licence applications based on licensing criteria and principles in WICA, including the following environmental sections/ clauses within WICA and the Water Industry Competition (General) Regulation 2008.

> ***Water Industry Competition Act 2006***
>
> *"7 Licensing principles*
>
> *(1) In considering whether or not a licence is to be granted under this Part and what conditions are to be imposed on such a licence, regard is to be had to the following principles:*
>
> *(a) the protection of public health, the environment, public safety and consumers generally."*
>
> **Water Industry Competition (General) Regulation 2008**
>
> *"7 Matters as to which Minister must be satisfied in relation to licence applications: section 10 (4) (e)*
>
> *Before granting a network operator's licence, the Minister must be satisfied that the applicant has the capacity to carry out the activities that the licence (if granted) would authorise in a manner that does not present a significant risk of harm to the environment."*

In considering licence applications the Minister administering the WICA must be satisfied of such other matters that he/she considers relevant, having regard to the public interest.

Contaminated Land Management Act 1997

The *Contaminated Land Management Act 1977* (CLM Act) is administered by the Office of Environment and Heritage (OEH) and local councils. It provides a regime for investigating and, where appropriate, remediating land affected by contamination which represents a significant risk of harm to human health or the environment. The CLM Act specifies responsibilities for managing contaminated land and the role of the OEH in the assessment of contamination and the supervision of the investigation, remediation and management of contaminated sites.

No known contaminated sites will be disturbed or generated during the construction of the proposal. The proposal is located within an existing rural allotment and disturbance will largely be restricted to land that has been used for low key agricultural uses and rural living.

Threatened Species Conservation Act 1995

Developments requiring approval from a consent authority under Part 4 of the EP&A Act or activities requiring determination or approval by a determining authority under Part 5 of the EP&A Act, are required to be assessed in accordance with the *Threatened Species Conservation Act 1995* (TSC Act).

Section 111(4) of the EP&A Act requires a determining authority to consider the effects of an activity on the following:

(a) critical habitat, and

(b) in the case of threatened species, populations and ecological communities, and their habitats, whether there is likely to be significant effect on those species, populations or ecological communities, or those habitats, and

(c) any other protected fauna or protected native plants within the meaning of the *National Parks and Wildlife Act 1974*."

Section 5A of the EP&A Act outlines seven points which must be considered in order to determine the significance of the impact of a development or activity on the habitat of threatened species, population and ecological communities, known or considered likely to occur in the study area and environs. This assessment is commonly referred to as the 'seven part test'.

An appraisal of the impact of the proposal upon those potentially occurring TSC Act-listed species and communities was conducted and as summarised in Section 6 of this REF, indicate that the proposal will have no significant impact on threatened species, populations and ecological communities listed pursuant to the TSC Act. Further discussion of the impact of the proposal on flora and fauna is contained in Section 6 of this REF.

Heritage Act 1977

The *Heritage Act 1977* (Heritage Act) is concerned with the protection of scheduled heritage items, sites and relics. The NSW Heritage Office administers this Act. It is an offence under the Heritage Act to disturb any relics. Relics are defined in the Heritage Act as any item relating to European settlement that is greater than 50 years old. There are no known European heritage items identified within the site.

National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NPW Act) is relevant to the protection of Aboriginal artefacts and the protection of native flora and fauna. Consent is required under Section 90 (2) of the NPW Act to destroy

an Aboriginal artefact. This REF concludes that no Aboriginal objects or places are within the area and therefore an Aboriginal Impact Permit (AHIP) is not required for the proposed activity.

5.0 Consultation

Cooranbong Water has consulted with the Hunter Water Corporation (HWC) on a regular basis throughout the process associated with the approval of the North Cooranbong Residential Precinct (MP 07-0147). A letter of support from HWC regarding Cooranbong Water's application of a licence to be made to IPART under WICA to enable the provision of drinking water, recycled water and sewerage services to the development is contained in **Appendix 4**.

Consultation obligations under ISEPP and WICA will be carried out in due course and submissions considered as required under ISEPP and WICA.

JPG held a public meeting to discuss the LWC site / proposal at the Cooranbong Community Hall on the evening of 27 May 2014. The public meeting was facilitated by Mr Brian Elton from Elton Consulting Pty Ltd and featured the Development Director of JPG and the Managing Director of Flow Systems. Elton Consulting produced a set of detailed meeting minutes, as contained in **Appendix 4**, which have been provided to LMCC, Department of Planning and IPART. This was an open meeting for all interested parties and the State Member, Councillors, Council staff and Department of Planning and Environment staff were all invited to this meeting.

6.0 Environmental Assessment

This section of the REF provides a detailed description of the potential environmental impacts associated with the proposal during both construction and operation, and provides site-specific mitigation measures to ameliorate the identified potential impacts.

A comprehensive range of specialist studies were completed as part of the Concept Approval (MP 07-0147) for the North Cooranbong Residential Precinct and informed the development footprint that has been approved. As noted throughout this REF the sewage and recycled water reticulation systems will be located within the approved footprint and consequently the following sections contain relevant information from those specialist studies.

As outlined in further detail in Section 3, installation of the pressure sewer networks require much smaller infrastructure than traditional gravity sewers and is laid at shallower depths. Accordingly, the area of disturbance and impact on the environment are minimal compared to other development works such as broad scale clearing that will be carried out as part of the overall North Cooranbong Residential Precinct development.

All aspects of the environment potentially impacted upon by the proposal have been considered. A review of the comprehensive environmental assessment report prepared as part of the Concept Approval (MP 07-0147) and the Planning Proposal for the proposed re-zoning (RZ-3-2014) and all accompanying specialist studies, as contained in **Appendix 5** (in digital form only due to size), has found that only a small number of environmental factors are relevant for this REF. **Table 1** below highlights all of the environmental factors considered and shows those included in this REF that were considered relevant.

Table 1 Environmental factors considered

Environmental Factor Considered	Included for consideration in REF
Traffic & Transport	Yes
Flora and Fauna	Yes
Geotechnical and Contamination (Land Capability)	Yes
Bushfire Management	No
Infrastructure & Utilities	No
Heritage (Indigenous and non-Indigenous)	Yes
Socio-economic Values	Yes
Visual Impact	No
Noise Impact	Yes
Water Quality and Stormwater Management	Yes
Waste Generation	Yes
Odour and Air Quality	No

Works associated with the proposal will only be carried out as each stage of the North Cooranbong Residential Precinct is developed. Each stage of subdivision will have appropriate conditions imposed by the consent authority with additional site specific investigations carried out as required. Due diligence will be demonstrated and all contractors involved will be made aware of statutory obligations and concept approval

conditions. A Construction Environmental Management Plan (CEMP) for the project works which will be adhered to.

The following provides a summary of relevant environmental issues sourced from **Appendix 5** and from more recent desktop database searches.

6.2 Geotechnical and Soil Conditions

Douglas Partners Pty Ltd were engaged to undertake an assessment of the site specific geotechnical opportunities and constraints for the North Cooranbong Residential Precinct to inform investigations for Concept Approval (MP 07-0147) and the Planning Proposal for re-zoning of Lot 12 1158508 (RZ-3-2014).

6.2.1 Existing Environment

The site is underlain by Triassic aged Narrabeen Group, generally comprising chert sandstone, quartzose sandstone, conglomerate, shale and claystone. A shallow soil profile was generally observed with silty topsoil overlaying clay and silty clay soils. Sandstone outcrops where observed at the base of some erosion scours.

Generally speaking the geology of the site means it can be readily excavated by conventional earthmoving equipment and the geology of the site does not constrain future development. Specific site investigations will be made to quantify the exact geology of the particular area to be developed, which will be carried out at each subdivision stage.

6.2.2 Potential Impacts

A number of potential contaminates were identified in the comprehensive environmental assessment report prepared as part of the Concept Approval (MP 07-0147) are all considered to be minor contamination issues. The concept plan has been designed to avoid any areas of potential constraint or contamination. Site specific contamination assessments will be undertaken at the DA stage for each subdivision application.

6.2.3 Proposed Mitigation Measures

Apart from some initial overall site remediation to be carried out prior to any works commencing on site, there are no site specific mitigation measures currently suggested. These will be outlined in contamination assessments that will occur at the DA stage for each subdivision.

6.2.4 Conclusion

Review of the geological conditions of the site indicates that it is suitable for the proposed development. No geotechnical constraints adversely affect the site as a whole and the concept plan is responsive to any limitations. Those areas with contamination issues can be suitably addressed by future specific reporting to determine the extent of the constraint and mitigation methods at the DA stage for each subdivision.

6.3 Flora and Fauna

A number of specialist investigations and reports were prepared to provide an adequate and in-depth level of ecological data for the Concept Approval (MP 07-0147) and the Planning Proposal for re-zoning of Lot 12 1158508 (RZ-3-2014). These documents are contained within **Appendix 5**.

6.3.1 Existing Environment

The Cooranbong area is generally low lying with the exception of the subject site, which is dominated by a ridgeline running south to north towards the adjoining Mt Cooranbong. The subject site is relatively gently undulating, ranging in elevation from 5m to 45m AHD.

The site currently supports areas of cleared land, native vegetation and areas of disturbed native vegetation. A known history of logging and disturbance across the North Cooranbong Residential Precinct has resulted in a stand of relatively young canopy trees and lower species diversity in certain areas.

In summary, flora assessments found the following vegetation on the site:

- A total of 312 species (263 native and 49 exotic) were recorded as part of the site flora assessment.
- Four (4) vegetation communities were identified on the site:
  - Coastal Plains Smoothbarked Apple Woodland,
  - Coastal Plains Scribbly Gum Woodland,
  - Riparian Melaleuca Swamp Sclerophyll Woodland, and
  - Alluvial Tall Moist Forest.
- One endangered community listed under the TSC Act was recorded on the site:
  - Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions.
- Three species listed on the EPBC Act and the TSA Act were recorded on the site:
  - *Angophora inopina - Charmhaven Apple,*
  - *Grevillea paviflora subsp. Paviflora – Small Flower Grevillea, and*
  - *Tetratheca juncea – Tetratheca.*
- Three species of regional conservation significance were recorded on the site:
  - *Blandfordia grnadiflora,*
  - *Hakea bakeriana, and*
  - *Tetratheca juncea*
- One noxious weed as classified for the Lake Macquarie LGA was recorded on site as being *Ageratina adenophora*.

Baseline fauna studies have been conducted on this site since the developer first became involved in the development in 2000. Studies previously conducted, and which formed part of the EA submission used to acquire Concept Approval (MP 07-0147), analysed the existing fauna communities with respect to the relevant legislative framework.

Austeco Pty Ltd undertook a site specific fauna assessment of the subject site to provide baseline data on the fauna of the site. The report concluded that 15 threatened species were either on the site, likely to be on the site (due to potential habitat) or possible to frequent the site. **Table 2** lists these species, their presence or likelihood of being present, and micro and macro habitats.

Table 2 Threatened Fauna Species

Threatened Species	Macrohabitats	Microhabitats	Present
Glossy Black Cockatoo *Calyptorhynchus lathami*	DSF, WSF, SF	Large hollows Casuarinas	Present
Swift Parrot *Lathamus discolour*	SF	Swamp Mahogany	Likely
Regent Honeyeater *Xanthomyza*	SF	Swamp Mahogany	Likely
Powerful Owl *Tyto novaehollandiae*	WSF, SF, DSF	Large tree hollows	Likely
Masked Owl *Tyto novaehollandiae*	WSF, SF, DSF	Large tree hollows	Likely
Spotted-tailed Quoll *Dasyurus maculatus*	WSF, DSF, SF		Likely
Koala *Phascolarctos Cinereus*	WSF, DSF, SF	Food Trees Mature forest	Possible
Squirrel Glider *Petaurus norfolcensis*	SF, DSF	Medium hollows Banksia spp. Swamp Mahogany Red Bloodwood	Possible
Grey-headed Flying Fox *Pteropus poliocephalus*	SF	Swamp Mahogany	Present
East-coast Free-tailed Bat *Mormopterus norfolkensis*	WSF, DSF, SF	Small hollows	Present
Little Bent-wing Bat *Miniopterus australis*	WSF, DSF, SF	Small hollows	Present
Eastern Bent-wing Bat *Miniopterus schreilbersii oceanensis*	WSF, DSF, SF	All hollows	Present
Large-footed Myotis *Myotis adverus*	WSF, SF	All hollows	Present
Greater Broad-nosed Bat *Scoteanax*	WSF, DSF, SF	Small hollows	Present
Green-thighed Frog *Litoria brevipalmata*	WSF, SF	Riparian Forest Swamp Forest	Likely

WSF = Wet Sclerophyll Forest
DSF = Dry Sclerophyll Forest
SF = Sclerophyll Forest

6.3.2 Potential Impacts

Construction and operational impacts on biodiversity would be largely temporary and limited in scale due to the modified and somewhat disturbed nature of the site. Works proposed in this proposal will be carried out within specific areas approved for each DA stage and will not have any additional impacts to those identified during each DA assessment and carried out as part of works for the overall development.

All impacts to threatened species and communities within the North Cooranbong Residential Precinct application area have been dealt with under the Concept Approval (MP07-0147) and Federal DoE approvals (EPBC 2011/5898 and 2014/7315). Both approvals are conditional and required the provision of offsets for the proposed impacts of the North Cooranbong residential precinct proposal plus the development of a detailed CEMP to manage environmental impacts during construction. Conservation offsets and compensatory packages have been negotiated between OEH, NSW Department of Planning and Infrastructure and the developer.

The proposal subject of this REF falls within the North Cooranbong Residential Precinct and as such the ecological impacts of this proposal have already been resolved at a state and federal level. The development of the site will be conducted in accordance with the Cooranbong Water CEMP to reduce any potential impacts resulting from the construction of the proposal.

6.3.3 Proposed Mitigation Measures

Works will be carried out in accordance with Concept Approval (MP07-0147) and future LGA staging approvals approved under Part 4 of the EP&A Act. Site specific mitigation measures, as provided below, will be adhered to during the construction phase of the proposal.

- The full extent of any vegetation clearance will be clearly documented and mapped in the site's Construction Environmental Management Plan (CEMP). The CEMP will prepared by Cooranbong Water prior to the commencement of construction.
- The clearing extents are to be clearly demarcated with temporary fencing before commencement of works.
- Materials/ equipment lay-down areas will be shown in the CEMP and located in cleared or degraded areas to prevent any damage to the surrounding vegetation or habitat.
- Materials, plant and equipment will not be stored within the drip-lines of any trees to be retained within the site.
- Where excavated soil is to be used in site restoration, it will be excavated and stockpiled in sequential layers corresponding to the existing soil profile. Topsoil and leaf litter is to be removed first and windrowed in separate stockpiles of less than 1m in height on the upslope side of excavations. Soil layers will be replaced sequentially so that the soil profile is restored as closely as possible to its pre-work status.
- Degradation or disturbance to areas of water-side (riparian) vegetation will be avoided to the greatest possible extent. Any such areas will be clearly identified in the CEMP.
- To prevent damage to vegetation outside the boundaries of the site, vehicles and machinery will be restricted to designated work areas; and
- All temporary erosion and sediment control devices such as silt-stop fencing will be removed from the site at the completion of the works or when the site is stabilised.

6.3.4 Conclusion

Previous ecological assessments have provided an in-depth discussion and assessment of the approved Concept Plan in relation to ecological matters at both local and regional scales. It has been shown that through the provision of land for conservation, the inclusion of an important vegetated corridor and riparian zones, combined with an agreed compensatory package to OEH for offsite conservation, there is ample evidence that the improve or maintain principle has been met.

The proposal is unlikely to have a significant impact on any threatened species, populations, ecological communities or migratory species in the locality. Mitigation measures will be incorporated into the CEMP for the site to ensure that the impact of the proposal on the environment is minimised.

6.4 Aboriginal Heritage

A search was undertaken of the Aboriginal Heritage Information System (AHIMS) database for the Concept Approval (MP 07-0147) and the Planning Proposal for re-zoning of Lot 12 DP1158508 (RZ-3-2014). The search revealed that there are no aboriginal sites recorded in or near the site and no aboriginal places have been declared in or near the above location. A copy of the search is contained in **Appendix 6**.

Myall Coast Archaeological Services were engaged to undertake an assessment of the archaeological constraints for the North Cooranbong Residential Precinct to inform investigations for Concept Approval (MP 07-0147).

6.4.1 Existing Environment

The assessment found that urban development of the North Cooranbong Residential Precinct land is not affected by matters of Aboriginal archaeological significance. The Koompahtoo Local Aboriginal Land Council was consulted and the assessment noted the following:

- Potential archaeological sites within the subject land include isolated finds and open campsites;
- It is not likely that burial sites or ceremonial features will be found;
- Trees are either too recent or of inappropriate type for scare trees;
- There is no exposed rock on the site and the possibility of the area containing axe-grinding grooves is negligible. Accordingly, the possibility of art work is non-existent;
- The site was probably used in the past as an occasional food source and for fostering animal life; and
- The presence of wetlands/drainage areas also implies a likely Aboriginal occupation, but given the close proximity of a greater food/water source to the east, this site was possibly a less frequented source.

The assessment also concluded that there is no significance of the site with regard to social, historic, scientific or aesthetic values.

6.4.2 Potential Impacts

The result of the AHIMS search, as contained in **Appendix 6**, and field study indicate that there are no identified Aboriginal objects on site. As there are no identified Aboriginal objects on the site there is no identified risk of harm to Aboriginal objects and an AHIP is not required for the proposed activity.

The assessment identified that although it was probable that Aboriginals utilised the resources of the study area, it is unlikely that their activities would have left much lasting evidence of their visit than perhaps the odd isolated artefact, particularly as there has already been significant disturbance to the top soil. No archaeological evidence was discovered through the field study however it is possible that undetected sites and artefacts may remain in the study area as subsurface artefacts. As such due diligence measures are to be taken during any works carried out.

6.4.3 Proposed Mitigation Measures

A number of recommendations were made in the assessment, in consultation with the Local Aboriginal Land Council and under the legal requirements of the NPW Act 1974, being:

- An area along the creek line and to the west of the chicken sheds at the extreme southern boundary of the site as an area that may require further assessment, should this specific area be considered for future development. This area is however proposed to be Environmental, and as such there will be no development in this area;
- There is no impact on Aboriginal Places or Objects or Potential Aboriginal Deposits and there is no impediment to the proposed development for Aboriginal Cultural reasons;
- The development is not an integrated development and referral to NPWS is not required and neither is a permit under Section 90 of the NPW Act for the development to proceed; and
- That the proponent informs all workers to be diligent when undertaking land preparation and if however, in the process of land preparation, artefacts are found, then work must cease and the LALC and NPWS be informed. To remove or destroy artefacts without a permit is an offence under Section 90 of the NPW Act, 1974.

Mitigation measures for the sewage and recycled water reticulation system include the following:

- All relevant Cooranbong Water staff and contractors should be made aware of their statutory obligations for heritage under the *National Parks and Wildlife Act* 1974 and the *Heritage Act* 1977, which may be implemented as a heritage induction.
- If unrecorded Aboriginal object/s are identified on the site during works, then all works in the immediate area must cease and the area should be cordoned off. OEH must be notified by ringing the Enviroline 131 555, so that the site can be adequately assessed and managed.
- In the unlikely event that skeletal remains are identified, work must cease immediately in the vicinity of the remains and the area must be cordoned off. The proponent must contact the local NSW Police who will make an initial assessment as to whether the remains are part of a crime scene or possible Aboriginal remains. If the remains are thought to be Aboriginal, OEH must be contacted by ringing the Enviroline 131 555. An OEH officer will determine if the remains are Aboriginal or not; and a management plan must be developed in consultation with the relevant Aboriginal stakeholders before works recommence.
- If, during the course of development works, suspected historic cultural heritage material is uncovered, work should cease in that area immediately. The Heritage Branch, OEH (Enviroline 131 555) should be notified, and works are only to recommence when an approved management strategy has been developed.

6.4.4 Conclusion

No Aboriginal objects or places have been identified within the area and therefore an Aboriginal Impact Permit (AHIP) is not required for construction and ultimately operation of the proposal.

6.5 Non-Aboriginal Heritage

6.5.1 Existing Environment

The State Heritage Inventory is maintained by the Heritage Branch of the Office of Environment & Heritage (NSW). It contains State non-Indigenous heritage information including:

- State Heritage Register
- Section 170 Heritage Items
- Locally significant items

A search of the State Heritage Inventory database on 9 January 2015 identified three items/places in the Cooranbong locality which are detailed in **Table 3.**

Table 3 Items listed on the State Heritage Inventory

Item	Address	Heritage Listing	Significance	Proximity to Project Area
Cottage	661 Freemans Drive, Cooranbong	State Heritage Inventory	Local	200m
House 'Three Bells'	597 Freemans Drive (west side)	State Heritage Inventory	Regional	200m

No historic heritage items were identified within the site. The local and regional historic items were the closest to the site include a Cottage approximately 200 metres north east and the Three Bells house approximately 200 metres south west. As these two items are situated outside the site and are located at a sufficient distance that they do not place constraints for the proposed activity.

The LM LEP 2014 provides a list of historic items that have been listed by the Council as having heritage value. In some cases items of Aboriginal cultural heritage are also listed.

A search of the relevant Schedules within LM LEP 2014 identified 18 items in the Cooranbong area however these items are located 500 metres and more from the site and therefore place no constraints for the activity.

Therefore, the proposal is unlikely to impact on non-aboriginal heritage at the construction stage, and hence mitigation measures for non-aboriginal heritage are not necessary.

6.5.2 Conclusion

There are no non-Aboriginal heritage items located within the area to be disturbed. The proposal is unlikely to affect identified heritage listed items in the broader vicinity.

6.6 Water Quality Management

Patterson Britton and Partners Pty Ltd was engaged to identify and address the various water management issues for the North Cooranbong Residential Precinct to inform investigations for Concept Approval (MP 07-0147). The report outlines water management principles that are to be adopted in the formation of a sustainable water management strategy for the proposal with particular emphasis on the implementation of a water-sensitive urban design approach in order to contribute to the long term sustainability of the site and its surrounding environment. The implementation of the Stormwater Management Plan ensures that the quality of water leaving the site will not have a detrimental effect on the receiving catchment due to any onsite activity.

6.6.1 Existing Environment

The site is located on undulating terrain and as such, there are several sub catchments draining in various directions, several of which contain watercourses. Approximately half of the site drains via the main creekline to the southeast towards Freemans Drive. The remainder of the site is divided into smaller sub catchments which drain generally to the north and west.

In addition to the riparian corridors associated with the aforementioned creeklines, there are ecological corridors throughout the site.

6.6.2 Potential Impacts

It is unlikely that significant impacts on water quality will occur due to construction as the works are largely temporary and limited in scale due to the modified and somewhat disturbed nature of the site. Works proposed in this proposal will be carried out within specific areas approved for each DA for subdivision stage and will not have any additional impacts to those carried out as part of works for the overall development.

6.6.3 Proposed Mitigation Measures

The implementation of a water management system and a Stormwater Management Plan will provide adequate treatment of runoff from construction works and opportunity to contribute to an improvement in the overall environmental quality of the North Cooranbong Residential Precinct and for each approved DA stage. Mitigation measures will be incorporated into the CEMP for the site to ensure that the impact of the proposal on the environment is minimised.

6.6.4 Conclusion

Site specific water management actions, consistent with the Water Management Strategy and Stormwater Management Plan for the entire area, will be prepared at each DA stage to ensure all potential impacts are identified prior to works commencing and mitigation measures implemented.

6.7 Noise

6.7.1 Existing Environment

The existing area surrounding the proposal site is predominantly rural in nature. Residential areas are currently located within the urban confines of Cooranbong.

6.7.2 Potential impacts

The main source of noise will be construction noise. Noise will be from machinery associated with any clearing of vegetation required (this will likely be carried out prior to works for this proposal) and earthworks. Due to the distance of the site from existing residences and the nature of the plant and equipment (relatively small scale) that will be used during construction the noise level during construction is unlikely to have an adverse impact on residential receivers.

6.7.3 Proposed Mitigation Measures

In line with industry best practice, the following mitigation measures are recommended to minimise the impact of potential construction noise from the proposal upon residential receivers.

- All equipment used will comply with AS2436-1981 Guide to Noise Control on Construction, Maintenance and Demolition Sites.
- Work and deliveries will only occur during the following times: Monday to Friday 7am to 6pm, Saturday 8am to 1pm. No construction work or deliveries will occur on Sundays or public holidays.
- Regular and effective maintenance of all equipment, including vehicles moving on and off the site, will be conducted.
- Plant and equipment which is used intermittently will either be shut down in the intervening periods between works or throttled down to a minimum.
- Any portable equipment with the potential to create high levels of noise (e.g. compressors, generators) will only be selected for use if it incorporates effective noise control. This equipment should be located, where practical, so that natural ground barriers are between it and the nearest potentially affected receivers.

6.8 Traffic

6.8.1 Existing Environment

The site is located north of Freeman Drive. Initial access will be via an unnamed road that will link the North Cooranbong Residential Precinct with Freemans Drive. As each DA stage is approved and developed access roads will be created for access.

6.8.2 Potential Impacts

Vehicle movements during construction will mostly consist of the floating of earthmoving equipment. Truck movements will occur at various stages throughout the construction period.

The proposal is unlikely to have significant impacts on the existing environment due to the temporary nature of the works and distance from existing residential areas.

6.8.3 Proposed Mitigation Measures

Cooranbong Water will employ all measures to ensure that the proposal does not significantly reduce road capacity or disturb traffic flows. Appropriate exclusion barriers, signage and site supervision will be employed at all times to ensure that the work site(s) are controlled and that unauthorised vehicles and pedestrians are excluded from the works area. The following mitigation measures will be applied throughout the duration of the works:

- The Contractor will maintain a complaints register. Any complaints received will be responded to as soon as possible.
- A traffic control plan prepared by a suitably qualified person will be submitted to Cooranbong Water for approval prior to commencement of work on the site.

6.9 Socio-Economics

6.9.1 Existing Environment

The proposal is located within the Lake Macquarie City LGA and surrounds the Cooranbong township. The North Cooranbong Residential Precinct has been identified after comprehensive environmental assessment and subsequent approval of Concept Approval (MP 07-0147).

6.9.2 Potential Impacts

Construction of the North Cooranbong Residential Precinct is likely to take approximately 10 to 15 years. There will be minor short term constructional impacts on existing local residents including the presence of machinery and associated traffic movements, and the minor visual impacts of these.

These impacts will be for a short period of time and will not create any long term socio-economic issues. Impacts from the proposal itself will be even

6.9.3 Conclusion

Provided that the mitigation measures documented in this REF are implemented there will be no significant socio-economic impacts other than the positive impact of enabling an identified growth area to be adequately serviced by the necessary sewer and recycled water reticulation infrastructure.

6.10 Waste Management

6.10.1 Potential Impacts

During excavation of the trenches any displaced soil will be stockpiled to one side and back filled. The soil stockpile will be protected from dispersion by runoff during storm events through the implementation of best practice Erosion and Sediment Control measures.

Any excess spoil will be utilised within wider development area. Construction waste (concrete, off cuts and general waste etc) will be stored and disposed of in accordance with waste disposal safeguards.

Waste materials likely to be generated by the proposal include:

- Green waste from clearing vegetation;
- Off-cuts of piping from construction works;
- Domestic waste such as paper, aluminium cans and material generated by workers.

Waste material will be disposed of off-site at an approved Council waste management facility.

6.10.2 Proposed Mitigation Measures

Waste generated would be managed in accordance with the CEMP for the works. The following mitigation measures will be applied throughout the duration of the works:

- All waste generated during the course of the works will be reused or removed from the work areas as soon as practicable and disposed of in accordance with the waste disposal safeguards;
- All vessels used for contaminated or hazardous waste should be sealed, labelled according to their contents, and stored within bunded areas until their removal from the work site;
- Any fuel, lubricant or hydraulic fluid spillages will be collected using absorbent material and the contaminated material disposed of at an OEH licensed waste depot;
- The work site will be left clean and free of debris and other rubbish at the end of works;
- All hazardous wastes on site will be removed and disposed in accordance with the state and national regulations and guidelines and best practice for the removal of these materials;
- The Contractor's recycling and reuse proposal will be detailed in the CEMP;
- Excess spoil materil that cannot be reused on site will be utilised in the ongoing earthworks as part of the adjacent subdivision stages;
- Green waste from vegetation clearing will be either chipped for reuse; retained for rehabilitation; or mulched and spread immediately after the trench has been covered to prevent encroachment by weed species and minimise erosion.
- Off-cuts of piping and other materials used will be recycled where possible.

6.10.3 Conclusion

The extent of the potential waste impacts is low due to the relatively small amounts of waste to be generated and the short time-frame for construction. There will be no onsite maintenance of vehicles and machinery. Refuelling of vehicles and machinery would be undertaken at designated refuelling stations off site.

In conclusion, the potential waste impact from the construction of the proposal will be low as the mitigation measures detailed above would be employed at all stages of construction works.

7.0 Summary of Mitigation Measures

Mitigation measures outlined in this document will avoid or reduce the potential impacts of the proposal. These mitigation measures have been designed to minimise and or mitigate, as far as practical, the potential impacts. All mitigation measures described in this REF will be incorporated into the contractor's CEMP and environmental management plan. A summary of the mitigation measures can be viewed in **Table 4** below. Common mitigation measures between key environmental issues have been amalgamated.

Table 4 Impact and Mitigation Measures to be Incorporated into the CEMP

Impact	Mitigation Measures
General	All contractors and machine operators will be inducted on the environmental sensitivities of the work site(s) and relevant safeguards.
Land Capability	Contamination assessments will be undertaken for each DA stage of subdivision
Flora and fauna	The full extent of any vegetation clearance will be clearly documented and mapped in the site's CEMP. The CEMP will prepared by the construction contractor prior to the commencement of construction.
	The clearing extents are to be clearly demarcated with temporary fencing before commencement of works.
	Materials, plant and equipment will not be stored within the drip-lines of any trees at the site.
	To prevent damage to vegetation outside the boundaries of access tracks, vehicles and machinery will be restricted to designated work areas.
	Where access tracks run alongside areas of natural bushland, protective fencing or paraweb fencing is to be installed along the boundaries of the track to prevent vehicles from inadvertently entering/damaging bushland.
	Degradation or disturbance to areas of water-side (riparian) vegetation will be avoided to the greatest possible extent. Any such areas will be clearly identified in the CEMP.
	Where excavated soil is to be used in site restoration, it will be excavated and stockpiled in sequential layers corresponding to the existing soil profile. Topsoil and leaf litter is to be removed first and windrowed in separate stockpiles of less than 1m in height on the upslope side of excavations. Soil layers will be replaced sequentially so that the soil profile is restored as closely as possible to its pre-work status.
	All temporary erosion and sediment control devices such as silt-stop fencing will be removed from the site at the completion of the works or when the site is stabilised.
Heritage (Aboriginal and non-Aboriginal)	All relevant staff and contractors should be made aware of their statutory obligations for heritage under the *National Parks and Wildlife Act 1974* and the *Heritage Act 1977*, which may be implemented as a heritage induction.
	If unrecorded Aboriginal object/s are identified on the site during works, then all works in the immediate area must cease and the area should be cordoned off. OEH must be notified by ringing the Enviroline 131 555, so that the site can be adequately assessed and managed.
	In the unlikely event that skeletal remains are identified, work must cease immediately in the vicinity of the remains and the area must be cordoned off. The proponent must contact the local NSW Police who will make an initial assessment as to whether the remains are part of a crime scene or possible Aboriginal remains. If the remains are thought to be Aboriginal, OEH must be contacted by ringing the Enviroline 131 555. An OEH officer will determine if the remains are Aboriginal or not; and a management plan must be developed in consultation with the relevant Aboriginal stakeholders before works recommence.
	If, during the course of development works, suspected historic cultural heritage material is uncovered, work should cease in that area immediately. The OEH (Enviroline 131 555) should be notified, and works are only to recommence when an approved management strategy has been developed.
Water quality management and stormwater	Sediment and nutrient controls will be implemented to reduce the impacts of stormwater, erosion and sedimentation on water quality. Specific erosion and sediment controls are to be contained within the site CEMP.

Impact	Mitigation Measures
	All erosion and sediment control measures will be established before excavation and vegetation clearance begins. Control measures are to remain in place until all surfaces have been fully restored and stabilised.
	Sediment and erosion control devices will be inspected regularly, maintained to ensure effectiveness over the entire duration of the project, and cleaned out before 30% capacity is reached.
	Sediment fences down slope of all disturbed areas and material stockpile areas.
	Disturbed areas will be stabilised by revegetation within 10 days after completion of construction.
	Site disturbance will be minimised by containing machinery access to site areas required for approved construction works.
	Erosion potential would be limited by managing runoff fetches and velocities, with measures such as contour drains, silt fences and level spreaders
	Sediment filters such as silt fences, coir logs, or turf strips will be located downstream of disturbed areas.
	The storage and handling of fuels and chemicals shall comply with Australian Standard AS1940.
	No chemicals, fuels, and/or waste will be stored or collected for disposal within or adjacent to drainage lines or unsealed surfaces.
	A 'spill kit' will be kept on site at all times for potential chemical or fuel spills.
	Refuelling, fuel decanting and vehicle maintenance work will take place in a designated sealed and bunded area.
	An Incident Management Plan (IMP) will be prepared as part of the CEMP and will include a contingency plan and emergency procedures for dealing with the potential spillage of fuel or other environmental incidents that may occur on the work site. The IMP should also contain procedures dealing with the unexpected onset of rainfall during the work period.
	Drainage systems will be checked at regular intervals and maintained to ensure they are operating at full capacity (eg clearance of debris from drainage lines).
Noise	All equipment used will comply with AS2436-1981 Guide to Noise Control on Construction, Maintenance and Demolition Sites.
	Work and deliveries will only occur during the following times: Monday to Friday 7am to 6pm, Sunday 8am to 1pm. No construction work or deliveries will occur on Sundays or public holidays.
	Regular and effective maintenance of all equipment, including vehicles moving on and off the site, will be conducted.
	Plant and equipment which is used intermittently will either be shut down in the intervening periods between works or throttled down to a minimum.
	Any portable equipment with the potential to create high levels of noise (e.g. compressors, generators) will only be selected for use if it incorporates effective noise control. This equipment should be located, where practical, so that natural ground barriers are between it and the nearest potentially affected receivers.
Traffic and access	The Contractor will maintain a complaints register. Any complaints received will be responded to as soon as possible.
	A traffic control plan prepared by a suitably qualified person will be submitted for approval prior to commencement of work on the site.
Waste generation	All waste generated during the course of the works will be reused or removed from the work areas as soon as practicable and disposed of in accordance with the waste disposal safeguards.
	All vessels used for contaminated or hazardous waste should be sealed, labelled according to their contents, and stored within bunded areas until their removal from the work site.
	Any fuel, lubricant or hydraulic fluid spillages will be collected using absorbent material and the contaminated material disposed of at an OEH licensed waste depot.

Impact	Mitigation Measures
	The work site will be left clean and free of debris and other rubbish at the end of works.
	All hazardous wastes on site will be removed and disposed in accordance with the state and national regulations and guidelines and best practice for the removal of these materials.
	The Contractor's recycling and reuse proposal will be detailed in the CEMP.
	Excess spoil material that cannot be reused on site will be utilised in the ongoing earthworks as part of the adjacent subdivision works.
	Green waste from vegetation clearing will be either chipped for reuse; retained for rehabilitation; or mulched and spread immediately after the trench has been covered to prevent encroachment by weed species and minimise erosion. NB: where mulched vegetation is to be used measures to prevent organic material entering the local waterway shall be installed.
	Off-cuts of piping and other construction material will be recycled where possible.
Amenity and public information	The Contractor will maintain a complaints register. Any complaints received will be responded to as soon as possible.
	Accurate public information signs will be displayed while work is in progress and maintained in presentable manner.

8.0 Cumulative Impacts and ESD

8.1 Cumulative Impacts

8.1.1 Description of Impact

The impacts on the environment due to the construction of the proposal are considered to be minor. There will be a minor increase in traffic during the construction phase mainly due to work trucks and employee vehicles. The installation of the sewer and recycled water system pipes will occur simultaneously with development of the subdivision and construction traffic for which will enter initially via the proposed road off Freeman Drive.

Construction of the proposal will allow the provision of reticulated sewer and recycled water services to new homes. The proposal will not affect any likely future activities.

Positive cumulative environmental and social impacts will result from the installation of the sewer and recycled water systems. It will make a significant contribution to sustainability through the provision of recycled water back to the planned residential areas.

The assessment under this section shows that the activity is not likely to have a significant effect on the environment. A range of environmental factors as listed in Clause 228 of the Environmental Planning and Assessment Regulation (as amended) and Commonwealth Matters of National Environmental Significance have been considered as contained in **Appendix 1**.

8.1.2 Mitigation Measures/Safeguards

Implementation of the mitigation measures and safeguards identified will minimise the risk of any impact and therefore further reduce the significance of any effect of cumulative impacts.

8.2 Ecologically Sustainable Development

8.2.1 Description of ESD

Ecologically Sustainable Development involves the conservation and enhancement of a community's resources, so that the overall quality of life can be increased now and in the future. The aim is to meet the needs of a community and to conserve surrounding ecosystems for the benefit of future generations.

Ecologically Sustainable Development means changes to the use of resources, and includes improvements in the quality of air, land and water, and in the development of environmentally friendly products and processes.

The construction of the proposal will not pose any significant ecological impacts, and will provide benefits for current and proposed residential subdivisions in the area.

8.2.2 The Proposal and Principles of ESD

The proposal involves the installation and operation of a sewage reticulation pressure system within the entire JPG controlled lands of the North Cooranbong Residential Precinct and Lot 12 DP 1158508. The proposal also includes the installation and operation of a recycled water reticulation system throughout the same area delivering high quality recycled water (non-potable uses such as toilet flushing, washing machines, irrigation and car washing) back to the new residential areas. The two systems will service around 2,100 residential lots. This construction will benefit the current and future community in providing

ready access to a sewage disposal and recycled water scheme that makes a significant contribution to sustainability.

Ecologically Sustainable Development involves the conservation of resources and providing benefits for local communities. This proposal complies with all principles of ESD including conserving the community's resources. This proposal will enhance both current and future residents within the area.

9.0 Conclusions

9.1 Summary of Beneficial Effects

Construction of the proposal will benefit the current and future community in providing ready access to a sewage disposal and recycled water scheme that makes a significant contribution to sustainability. Given the essential need for this infrastructure, the type and location of the proposal is assessed as providing the community with the best outcome in terms of type, operation and location.

9.2 Summary of Adverse Effects

The proposal will result in minimal adverse effect upon the environment. The proposal will be built in conjunction with the civil works associated with Concept Approval (MP 07-0147) and subsequent DAs for subdivision.

Various minor environmental impacts have been identified in this REF and these are generally temporary in nature. Specifically, it is unlikely that the proposal will have a significant impact on threatened species, populations and ecological communities listed pursuant to the TSC Act, or impact on matters of National Environmental Significance pursuant to the EPBC Act. There are no long term adverse effects created by the construction of the proposal.

9.3 Conclusion

Construction of the proposal will provide a service essential for the North Cooranbong Residential Precinct and greatly benefit the community by ensuring supply of affordable housing for the Lake Macquarie area.

The minor adverse effects that have been identified are considered minor and only short term.

The REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposal. A number of potential environmental impacts from the proposal have been avoided or reduced during the concept design development. The proposal as described in the REF best meets the project objectives. The REF notes that ecological impacts of this proposal have already been resolved at a state and federal level. The proposal will result in beneficial impacts by providing a service essential for the development of the area which greatly benefits the community by ensuring security of supply.

This REF has been prepared in accordance with Part 5 of the EP&A Act. It has concluded that the proposal is unlikely to significantly affect the environment and hence an EIS is not required to be prepared under section 112 of the EP&A Act. The proposal is also unlikely to affect Commonwealth land or have an impact on any matters of national environmental significance.

This REF has also been prepared with due regard for the licensing criteria, principles and environmental clauses in the WICA and the *Water Industry Competition (General) Regulation 2008.* It is considered that the proposal is unlikely to present a significant risk of harm to the environment and approval of network operator's licence under the WICA and the *Water Industry Competition (General) Regulation 2008* would be in the public interest.

10.0 Declaration

I certify that I have prepared the contents of this Review of Environmental Factors and to the best of my knowledge:

- It is in accordance with Section 111 of the Environmental Planning and Assessment Act 1979 and clause 228 of the Environmental Planning and Assessment Regulation 2000;
- It examines and takes into account to the fullest extent possible all matters affecting or likely to affect the environment as a result of the activities associated with this project;
- It is true in all material particulars and does not, by its presentation or omission of information, materially mislead; and
- has been prepared with due regard for the licensing criteria, principles and environmental clauses in the WICA and the *Water Industry Competition (General) Regulation 2008.*

The proposal is not likely to significantly affect the environment and may be approved subject to mitigation measures detailed in this document. No EIS is required.

The proposal is unlikely to present a significant risk of harm to the environment and approval of network operator's licence under the WICA and the *Water Industry Competition (General) Regulation 2008* would be in the public interest.

Signed:

Name: Rob Dwyer

Position: Planning Manager

Date: 21th January 2015

Appendix 1

Consideration of the Clause 228 Factors and Matters of National Environmental Significance

The following factors, listed in Clause 228(2) of the Environmental Planning and Assessment Regulation 2000, are required to be considered to assess the likely impacts of the proposal on the natural and built environment.

Factor	Impact
1. Any environmental impact on a community? The proposal involves the construction and operation of sewage and recycled water reticulation systems for the North Cooranbong Residential Precinct Concept Approval (MP 07-0147). Ultimately the systems will service 2,100 residential lots. The environmental impact on the community will result in the efficient and hygienic removal of sewage from the new development and the creation of a recycled water scheme that makes a significant contribution to sustainability.	Positive long-term benefits.
There may be temporary impacts from increase in construction traffic and noise during the construction of the proposal. Development will be staged and occur at the fringe of previous stages. Deliveries and vehicle movements will only occur during the following times: Monday to Saturday 7am to 6pm. No construction work or deliveries will occur on Sundays or public holidays. Construction will take approximately 2 months per subdivision stage. A CEMP will be prepared prior to commencement of works.	Contractor will manage short-term negative impacts.
2. Any transformation of a locality? The area will be undergoing gradual transformation due to the progressive development of the North Cooranbong Residential Precinct (Concept Approval MP 07-0147). The proposal is an essential element of the New Town development and once constructed will be undetectable.	Positive – long term impacts that will accommodate existing and future development.
3. Any environmental impact on the ecosystems of the locality? Construction related impacts on biodiversity would be largely temporary and limited in scale due to the modified and disturbed nature of the local environment. The vast majority of disturbance will be isolated to grass and regenerating vegetation, much of which will disturbed earlier by subdivision works subject of separate approvals. These areas will be disturbed by clearing and earthworks. Post-construction cleared areas will be rehabilitated but it should be noted that the pipelines will be located within the proposed street network.	Long term negative impacts of vegetation removal have been determined to be minor.
The proposal is unlikely to have a significant impact on any threatened species, populations, ecological communities or migratory species in the locality. Mitigation measures will be incorporated into the CEMP for the site to ensure that the impact of the proposal on the environment is minimised.	Mitigation measures will reduce environmental impact on ecosystems.
4. Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality? The proposal is unlikely to reduce the aesthetic values of the site as the infrastructure will be underground.	Neutral impact – consistent with existing and desired future values.
5. Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations? The proposal does not impact on any identified areas of anthropological, archaeological, cultural, historical, scientific or social significance.	No impact identified.
6. Any impact on the habitat of protected fauna (within the meaning of the *National Parks and Wildlife Act 1974*)? The proposal does not impact on the habitat of protected fauna (within the meaning of the NPWS Act). All impacts to threatened species and communities within the North Cooranbong Residential Precinct application area have been dealt with under the Concept Approval (MP07-0147) and Federal DoE approval (EPBC 2011/5898). Both approvals are conditional and required the provision of offsets for the proposed impacts of the North Cooranbong residential precinct proposal plus the development of a detailed CEMP to manage environmental impacts during construction. Conservation offsets and compensatory packages	No impact identified within the meaning of the NPW Act 1974, and no significant impact pursuant to the TSC Act.

Factor	Impact
have been negotiated between OEH, NSW Department of Planning and Infrastructure and the developer.	
7. Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air? All impacts to threatened species and communities within the North Cooranbong Residential Precinct application area have been dealt with under the Concept Approval (MP07-0147) and Federal DoE approval (EPBC 2011/5898). Both approvals are conditional and required the provision of offsets for the proposed impacts of the North Cooranbong residential precinct proposal plus the development of a detailed CEMP to manage environmental impacts during construction. Conservation offsets and compensatory packages have been negotiated between OEH, NSW Department of Planning and Infrastructure and the developer. The REF concludes that it is unlikely that the proposal will have a significant impact on threatened species, populations and ecological communities listed pursuant to the TSC Act, or impact on matters of National Environmental Significance pursuant to the EPBC Act.	Minor impact identified but not endangering of any species.
8. Any long-term effects on the environment? The development of the proposal will not result in any long term effects on the environment additional to those which will have been addressed during the assessment of Concept Approval (MP 07-0147). Long term effects for the REF have been assessed and it is concluded that it is unlikely to be any long term effects.	Unlikely to be any long-term impacts. Short-term impacts will be reduced through appropriate mitigation and management.
9. Any degradation of the quality of the environment? The clearing of some vegetation to enable the construction may temporarily degrade the quality of the existing environment. This impact is to be mitigated through erosion, sediment and weed controls.	Degradation will be mitigated through appropriate management.
10. Any risk to the safety of the environment? The proposal may pose a minor risk to the environment if the necessary use of fuels, oils, greases and chemicals are discharged into the stormwater system if they are inappropriately stored. This risk is considered minimal and the occurrence of environmental hazards is considered to be extremely low. Impacts on the environment will be reduced by implementing effective storage of hazardous materials, erosion and sediment controls, appropriate stormwater and nutrient control systems to reduce the effects of runoff and ensure water flowing off the proposal area is of a suitable quality, ensuring that there are no accidental incursions into areas which are not subject to the proposal.	Risks will be managed through appropriate controls.
11. Any reduction in the range of beneficial uses of the environment? As the proposal is to be built in unison with the orderly development of North Cooranbong Residential Precinct (MP 07-0147) approval no reductions in the range of beneficial uses of the environment are likely.	No significant reduction identified.
12. Any pollution of the environment? The proposal may pose a minor risk to the environment if the necessary use of fuels, oils, greases and chemicals are discharged into the stormwater system if they are inappropriately stored. This risk is considered minimal and the occurrence of environmental hazards is considered to be extremely low.	The risk will be managed through appropriate controls.
13. Any environmental problems associated with the disposal of waste? The proposal will be constructed to service development within North Cooranbong Residential Precinct (MP 07-0147) approval area. No environmental problems associated with the disposal of waste are likely to result from the proposal.	No waste disposal issues likely.
14. Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply? The proposal would not increase demands on resources, natural or otherwise that are or are likely to become in short supply in the future.	No impact identified.

Factor	Impact
15. Any cumulative environmental effect with other existing or likely future activities? The impacts on the environment due to the construction of the proposal are considered to be minor. There will be a minor increase in traffic during the construction phase mainly due to work trucks and employee vehicles. The installation of the sewer and recycled water system pipes will occur simultaneously with development of the subdivision and construction traffic for which will enter initially via the proposed road off Freeman Drive. Construction of the proposal will allow the provision of reticulated sewer and recycled water services to new homes. The proposal will not affect any likely future activities. Positive cumulative environmental and social impacts will result from the installation of the sewer and recycled water systems. It will make a significant contribution to sustainability through the provision of recycled water back to the planned residential areas.	Long term positive impact.

Matters of National Environmental Significance

Under the environmental assessment provisions of the Environment Protection and Biodiversity Conservation Act 1999, the following Matters of National Environmental Significance are required to be considered to assist in determining whether the proposal should be referred to the Australian Government Department of the Environment and Water Resources.

Factor	Impact
1. Any impact on a World Heritage property?	
There are no world heritage properties within the vicinity of the proposal.	Nil
2. Any impact on a National Heritage place?	
There are no National Heritage places within the vicinity of the proposal.	Nil
3. Any impact on a wetland of international importance?	
There are no wetlands of international importance located within 5km of the proposal.	Nil
4. Any impact on a listed threatened species or communities?	
As described in the REF, it is not anticipated that there would be any negative impact on a Commonwealth listed threatened species or ecological communities.	Nil
5. Any impacts on listed migratory species?	
Due to the small scale of the proposed vegetation clearing, the activity is not considered likely to result in a significant environmental impact on any Commonwealth listed migratory species provided mitigation measures are implemented.	Nil
6. Any impact on a Commonwealth marine area?	
No Commonwealth marine areas are located within 10km of the Proposal.	Nil
7. Does the proposal involve a nuclear action (including uranium mining)?	
The Proposal will not involve a nuclear action.	Nil
Additionally, any impact (direct or indirect) on Commonwealth land?	
No Commonwealth Land is located in proximity to the study area.	Nil

Appendix 2

Sewage Reticulation Masterplan

Stage	Loadings (ET)
Stage 1E & 1F (I)	40
Stage 1G & 1H (I)	41
Stage 2A (II)	31
Stage 2B (II)	35
Stage 2C (II)	39
Stage 2D (II)	33
Twine & Thomson (III)	75
III (excluding Jackson & Mears)	40
IV	146
V	113
VI	107 +Primary School (28) +Corner Shop (5) +Medium Density Residential (12)
VII(a)	116 +Open Space including Amenities (2)
VII(b)	36
VIII	188
IX	161
X	152
XI	231
XII	90
Medium Density Residential	428
Commercial / Retail	58
Community Centre	2
Potential Future Extension	40
Overall Total	2249

Date: 27/05/2014

Rev: C

Drawing No: SK02

Scale: SCALE 1:3000 AT A0

NORTH COORANBONG MASTERPLAN

Cooranbong Water

flow systems

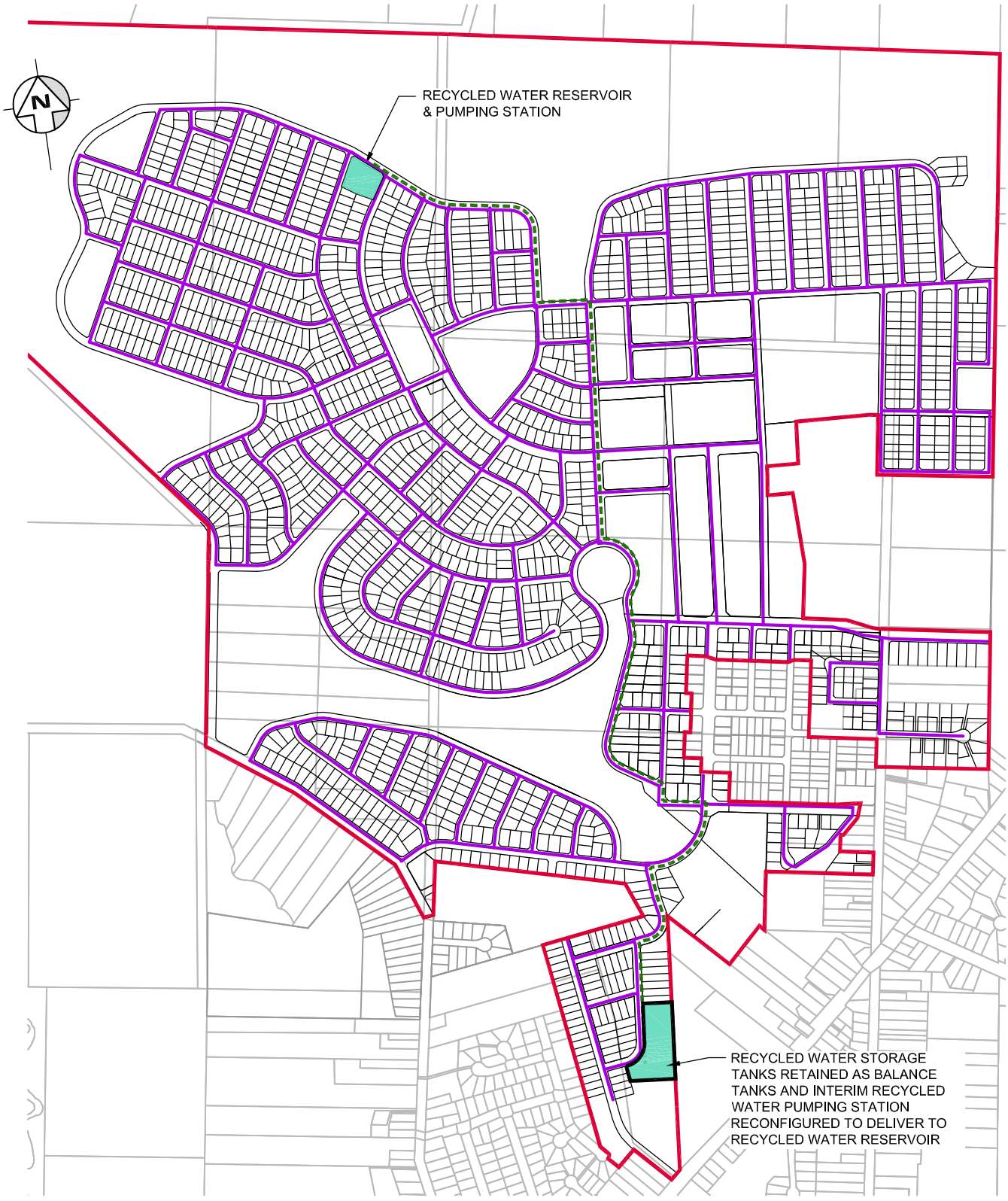
Pressure System Solutions Pty Ltd

Saved: 27.05.2014, By: kgao
J:\7000-Projects\702-Current projects\140310 Watagan Park\720- Design\721-Drawings\730- Street mains\Watagan Park_SK02.dwg

Appendix 3

Recycled Water Masterplan

FIGURE 9



LEGEND

DN100 PVC - M

DELIVERY MAIN TO RESERVOIR
(APPROX. DN250 PVC - M)

OPERATIONS BOUNDARY

flow systems

Cooranbong Water

WorleyParsons
resources & energy

NORTH COORANBONG
RECYCLED WATER MASTER PLAN
ULTIMATE DEVELOPMENT

O:\301020\06837 – Watagan Park Masterplan\12.0 Drawings\12.13 Water\FIGURES\301020-06837-FIG-09.dwg
28/05/2014

Appendix 4

HWC Correspondence and Community Issues

Hunter Water Corporation
ABN 46 228 513 446

PO Box 5171
HRMC NSW 2310
36 Honeysuckle Drive
NEWCASTLE NSW 2300
1300 657 657
(02) 4979 9625 (F)
enquiries@hunterwater.com.au

5 June 2014

Our Ref: 2007-94/23/23.005

Flow Systems
Suite 201, Level 2
1 Alfred Street
SYDNEY NSW 2000

COORANBONG WATER - UTILITY SERVICES AGREEMENT
Letter of Support - Independent Pricing & Regulatory Tribunal Licence Application

Hunter Water is offering this letter of support to form part of the 'Cooranbong Water' licence application being made by Flow Systems to the Independent Pricing and Regulatory Tribunal under the Water Industry Competition Act (WICA). Hunter Water understands that Cooranbong Water will be a wholly owned subsidiary of Flow Systems. 'Cooranbong Water' is referred to from here on in this correspondence.

In this instance the predominant land developer in North Cooranbong is JPG, holding approximately 2,350 lots of the planned 2,500 lot potential in the release area. JPG has engaged Cooranbong Water to supply a range of water utility services to 'Watagan Park' estate, amongst other relatively minor nearby developments comprising the release area.

Hunter Water is continuing to negotiate with Cooranbong Water regarding the bulk supply of drinking water and an interim point of connection to sewer services. Progress has been made on a number of technical and commercial terms. An initial draft 'Utility Services Agreement' has been provided to Hunter Water for consideration, joint development and future negotiation.

While the technical and commercial terms are yet to be finalised, it is intended that Hunter Water and Cooranbong Water enter a 'Utility Services Agreement' that contemplates:

Bulk Water Supply:

1. Hunter Water supplying bulk drinking water to Cooranbong Water at North Cooranbong;
2. Augmentation of Hunter Water's water network is to be undertaken by the developer in accordance with the approved North Cooranbong Development Water Servicing Strategy (Version C, September 2013), as amended, and in consultation with Cooranbong Water;
3. The points of connection to Hunter Water's water network are shown diagrammatically in Appendix A.

Interim Sewer Servicing:

4. On a commercial basis Hunter Water is willing to consider an interim single sewer point of connection for Cooranbong Water in lieu of their commissioned local wastewater treatment facility. This is subject to reaching a satisfactory commercial arrangement that adequately addresses Hunter Water's operational and environmental risks in a range of operating scenarios including the potential delayed availability of the wastewater treatment plant or the treatment plant not being able to be established at all.
5. Cooranbong Water have advised that the local waste water treatment facility will be available by August 2016. Hunter Water requires that the interim sewer connection arrangement, therefore, must be abandoned by August 2016, or as soon as the treatment plant is available, whichever is the earlier;

6. The interim sewer servicing arrangement must be controlled to ensure that by accepting the interim sewer discharges, Hunter Water is able to remain compliant with its own regulatory and licencing obligations and maintain service standards to its existing customers;

7. Flow Systems have advised that up to a maximum of 156 lots may connect during the period to establish the local wastewater treatment plant generating a peak sewer discharge of 4.0L/sec from the pressure sewer network.

8. Hunter Water requires that the proposed pressure sewer network operated by Cooranbong Water be able to be remotely isolated from the Hunter Water sewer network during a number of abnormal operating events. The satisfactory operation of the interim sewer servicing arrangement relies on the provision of 24 hours emergency storage on each lot and the ability to cease discharge as required from time to time.

9. The interim sewer connection point will need to be setup to provide interoperability with Hunter Water downstream assets. Isolation during power outages, high well alarms or other as yet unspecified events will be required.

Discharge of excess untreated or treated effluent to Hunter Water

10. Cooranbong Water have indicated that from time to time the need may arise to discharge either excess treated wastewater or, in the event that their treatment plant is offline, discharge untreated sewerage to Hunter Water's network.

11. Depending on the circumstance presented at the time of the need arising, Hunter Water will work with Cooranbong Water to assist where possible. The operational status of Hunter Water infrastructure at the time of the request will influence the ability of Hunter Water in this regard. Direct discharge to the local network, road tankering of waste to Dora Creek WWTW, or to other downstream assets may be possible.

12. Each request will be considered on its merit giving consideration to the operational and environmental impacts that may ensue for both network operators.

13. Depending on the characteristics of the discharge requested, tariff costs may be incurred by Cooranbong Water.

14. Hunter Water is not able to offer a standing arrangement that can be called upon at will by Cooranbong Water to discharge excess treated or untreated sewerage.

Other matters

15. Cooranbong Water will be responsible for the provision of operation, maintenance and retail services to all customers upstream of the point of connection to the water and sewer network of Hunter Water.

16. Other interface requirements as needed.

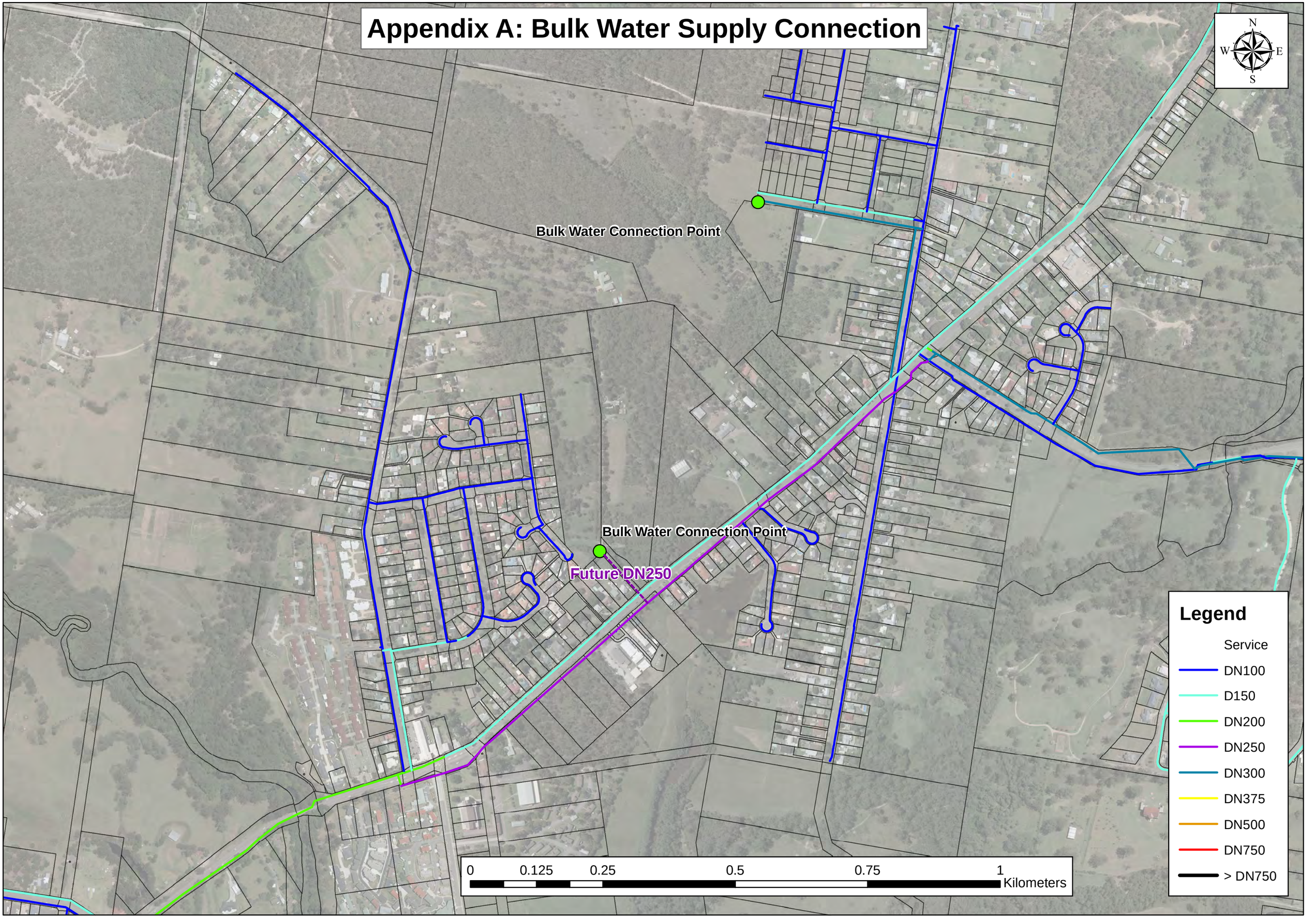
Hunter Water looks forward to establishing an ongoing commercial relationship with Cooranbong Water. Should you wish to discuss these matters further please contact me on (02) 4979-9495.

Yours faithfully

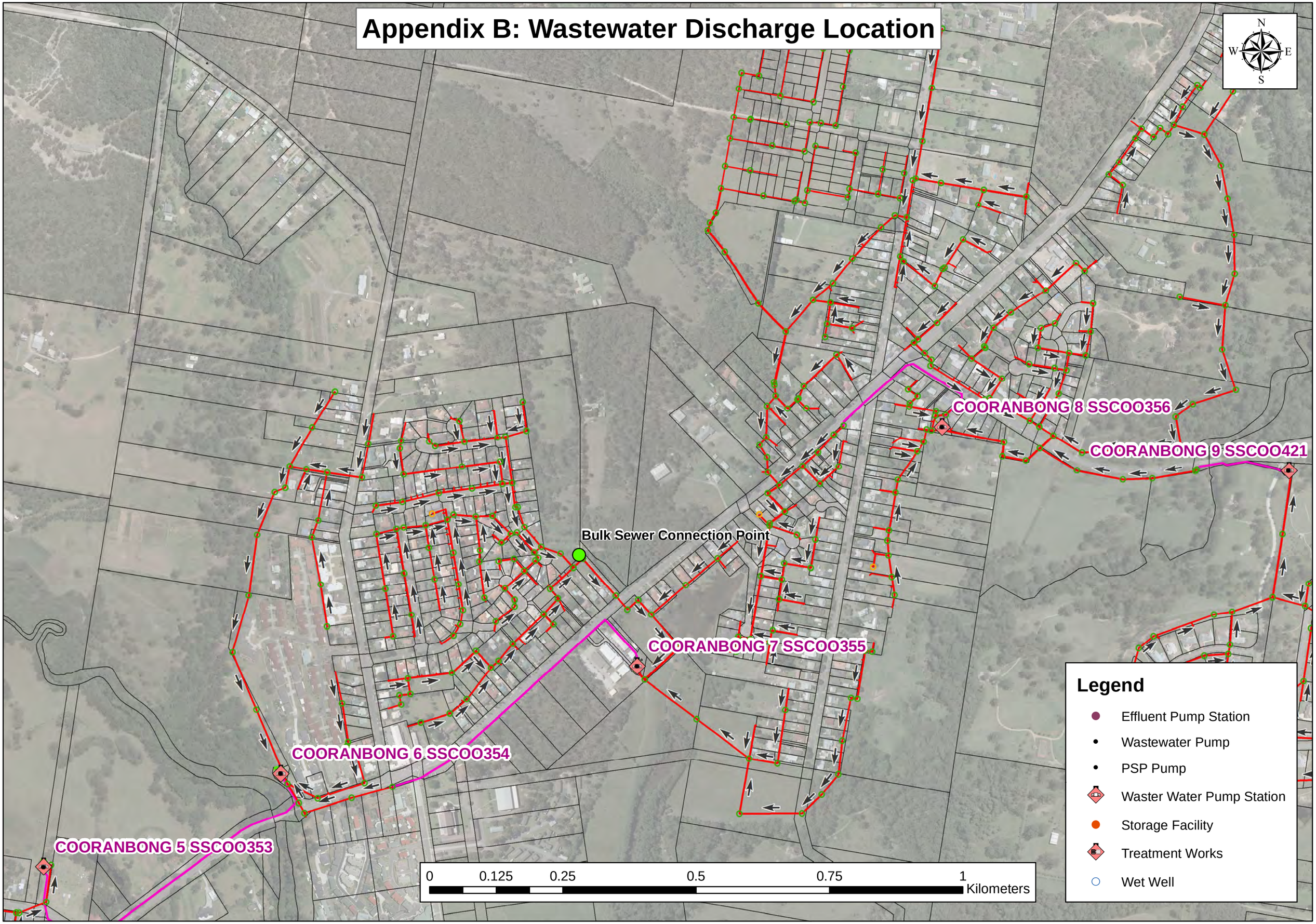
DEAN TAYLOR
Chief Customer Services Officer

Attached: **Appendix A – Water Connection Points**
Appendix B – Interim Sewer Connection Point

Appendix A: Bulk Water Supply Connection



Appendix B: Wastewater Discharge Location



North Cooranbong Community Meeting Notes

Meeting	**North Cooranbong community meeting regarding proposed Local Water Centre and recycled water scheme**				
Date	27 May 2014	**Venue**	Cooranbong Community Services Centre, 614 Freemans Drive, Cooranbong	**Time**	6:45pm – 8.30pm
Presenters	• Brian Elton - Managing Director, Elton Consulting (*Facilitator*) • Bryan Garland - Development Director, Johnson Property Group (JPG) • Terry Leckie - Managing Director, Flow Systems				

Apologies	• Hunter Water Corporation
	• Lake Macquarie City Council
	  ○ Mayor – Cr. Jodie Harrison
	  ○ Cr. Ken Paxinos
	  ○ Cr. Jason Pauling				

1	**Welcome** Brian Elton welcomed attendees and outlined the objective of the meeting. Objective: To brief the Cooranbong community on the proposed Local Water Centre and recycled water scheme for the North Cooranbong subdivision. To respond to questions from the community about the proposed Local Water Centre and recycled water scheme. Outline of opportunity to visit Flow Systems' facility in Pitt Town.				
2	**Presentation One** **North Cooranbong – planning process overview** Bryan Garland outlined the planning process involved in the development of the Local Water Centre. Both a proposal to rezone the land and separately a development application have been submitted to the Lake Macquarie City Council for the site. Thirdly, an application to IPART for a WICA (Water Industry Competition Act) license is scheduled to be submitted early June 2014. The issue of a license by IPART is pending either Council's approval of the rezoning application or the development application. Bryan outlined the location of the Local Water Centre site at 617 Freemans Drive.				
3	**Questions** *The following table includes the questions and responses discussed at the community meeting in relation to Bryan Garland's presentation. Those questions that could not be answered were taken on notice and the responses to these questions can be found below.*				
	Question/comment		**Response**		
	3.1 Is a Council representative here		BE: A number of Council representatives		

	tonight?	were invited to this event and we note a number of apologies from Council. *No person from the audience identified themselves as a member of Council.*
	3.2 If this technology has been around for a while, why wasn't this technology included as part of the Masterplan and placed at the physical centre of the planned development instead of the edge?	BG: The full suite of legislation (including Act and Regulations) opening up competition in the water industry was only gazetted at the end of 2008. This came into effect at the later end of the Masterplan approval process.
	3.3 Given that this Masterplan predates the agreement between COAG and the federal government, shouldn't this development be referred to SEWPAC and why was this not mentioned? I understand that two types of vegetation have already been referred.	BG: This development will only be referred to SEWPAC if it is found to impact on matters of national environmental significance. The whole of the previous Masterplan was referred to SEWPAC and environmental requirements have been placed on the land. The Local Water Centre site falls outside of that consideration.
	3.4 Does the rezoning for the new site at 617 Freemans Drive also include a residential application?	BG: Yes that is correct.
	3.5 Why did JPG originally put forward a recommendation for moratorium against further residential rezoning as part of JPG's 2013 submission on the draft Lower Hunter Regional Strategy?	BG: The Department of Planning has already rezoned approximately 50% of the land area identified for residential development from the August 2006 Lower Hunter Regional Strategy. In the absence of an infrastructure plan that supported the Lower Hunter Regional Strategy, we suggested that a moratorium should be placed on rezoning additional release areas that are further away from current infrastructure. 617 Freemans Drive is immediately adjacent to a State Significant Site release area and can be serviced with critical infrastructure.
	3.6 Who was the NSW Planning Minister when you put this project through?	BG: The approved Part 3A concept plan was signed by Kristina Keneally.

4	**Presentation Two** **Proposed Local Water Centre and recycled water scheme** Terry Leckie outlined who Flow Systems are, why they are involved in this infrastructure project, the function and processes of the Local Water Centre and the recycled water scheme. Flow Systems came into being in response to a government policy to create self-reliant communities and to allow private companies into the water services industry to create innovation and competition in the marketplace. To support this policy, the government introduced the Water Industry Competition Act of 2006. Flow Systems is a private water utility. Its licenses have been issued by the Minister for Finance and Services under the Water Industry Competition Act. Each time Flow Systems would like to offer their services to a new community they are required to obtain a new license. Flow Systems is currently contracted to provide water utility services to eight communities across the state. **The Centre:** The proposed Local Water Centre would be similar to the one currently operating in Pitt Town. The Pitt Town facility is the size of a large four bedroom house and has two large tanks beside it. This site has been architecturally designed. The site causes no more vehicle traffic than a normal residence, being serviced by the garbage collection once a week. There are no large trucks on the site, only the operator's ute. There are also no operator's permanently located on-site. **Homes:** Each home would feature a small sewer pump contained within a collection tank buried underground on the property. A small control box would also be placed on the side of each house. This control box allows Flow Systems to measure water usage in real time, identify potential leaks, and control the sewer pump. **Treatment of sewage:** Sewage is treated using a seven step process, including a membrane bioreactor, UV disinfection and chlorination. Recycled water will then be delivered to houses for toilet flushing, clothes washing and irrigation. **Operating philosophy:** Flow Systems is looking to employ plumbers and electricians from the local community to service the local reticulation network (water and sewer pipes and valves) and the residential infrastructure (e.g. sewer pumps, water meters etc.) Flow Systems will also be responsible for delivering drinking water sourced from Hunter Water to people's homes via separate pipes.

5	**Comments from Dr. Brian Timms** Dr Timms asked to make a few comments. Dr Timms mentioned that he was previously concerned about the operation of Flow Systems' recycled water system, however he no longer has this concern. He raised the issue of small levels of phosphate and nitrate leaking into the local gullies and waterways over the next 20-40 years, and highlighted that this process would be the same as the one used by Hunter Water and result in the same outcome. Terry Leckie agreed that this was a long-term issue and was happy to provide more information to the community about how Flow Systems would manage this.	
6	**Questions** *The following table includes the questions and responses from Terry's presentation discussed at the community meeting. Those questions that could not be answered were taken on notice and the responses to these questions can be found below.*	
	Question/comment	**Response**
	6.1 Instances of flooding in the area occur approximately every 5-6 years. These events can happen extremely quickly with little warning, resulting in large amounts of rain falling in only a few hours. How will you work with Hunter Water and what is your contingency in case of such an event?	TL: We are working with Hunter Water closely on a number of projects. We will have a protocol for notifying Hunter Water in the case of an event where it might affect their infrastructure. Our sewerage system is separate from stormwater and can continue to operate under flood conditions.
	6.2 Will the release of phosphates into the natural environment be addressed in the EIS?	TL: Yes this will be done as part of the EIS process.
	6.3 Are you happy to talk about another matter to do with the development project other than water?	BE: The focus of this community meeting is on water management.
	6.4 Where do you get rid of solid waste?	TL: There is a little bit of rubbish that is macerated (when passing through the grinder pumps) and screened that goes to landfill in the regular council garbage collection service until the volume is large enough to warrant a skip bin collection.
	6.5 At full build out, what is the volume of solid material that needs to be removed? How frequently is solid material removed	*Question taken on notice.* There are two scenarios for waste generation: liquid waste (excess

	and by what means?	wastewater) and solid waste (as a by-product of the treatment process). For liquid waste (eg. for short-term periods when there isn't sufficient demand for recycled water to keep up with the wastewater being generated by the community), our preference is to negotiate an agreement with Hunter Water to use their existing sewerage network to discharge any excess wastewater into. Solid waste disposal options will be considered in accordance with industry best practices for biosolids management. We are happy to keep the community informed, either through formal consultation processes or ongoing conversation as we develop these options.
	6.6 Will you be offering your services of capturing water, for example stormwater, for other homes in the community?	TL: Our services will include collection of wastewater, and providing drinking water and recycled water.
	6.7 How does the system cope with cleaning products that kill the organisms used to break down the sewage?	TL: We will distribute information to new residents about how to use the system. All of the collected wastewater is mixed up in the Local Water Centre's balance tank, which dilutes cleaning products before the wastewater enters the bioreactor, to the extent that they don't typically affect the treatment process.
	6.8 How do you compensate people for damages should there be any problems with your system?	TL: We have a customer contract with each customer of our services. This agreement has been reviewed by IPART (the NSW Government regulator of private water utilities).
	6.9 How long would it take for someone to fix any potential problem?	TL: Our monitoring of the system allows us to see if we have a burst or any

		unusual flows (eg. leaks) and where these are. We will employ plumbers in your local community who will help build the system and will be on call just down the road.
	6.10 How long does your piping last?	Our water and sewer networks (including piping) are designed and constructed in accordance with standard design guidelines published by the Water Services Association of Australia (WSAA), which is the peak industry body for the Australian urban water sector. <u>Additonal information provided on notice:</u> Our piping is made from the same materials, eg. high density polyethylene (HDPE) and PVC pressure pipe as specified by WSAA and widely used throughout Australia by public water authorities. These pipes are designed to have the same life expectancy as a typical domestic building, ie. more than 50 years, and real experience in Europe has shown that buried PVC pressure pipes dug up after 60 years of active use were proven to be fit for purpose when analysed and likely to have a further life expectancy of 50 years.
	6.11 What is the capacity of your facility should further development occur?	TL: For us to be sustainable we need to service 1,000 or more homes. This facility will have a capacity of 2,500 homes. If we need to service another community, we would build a new facility in a new location.
	6.12 Will the cost of running this piece of infrastructure be reduced if you are servicing 2,500 homes as opposed to 1,000?	TL: No, our consumer prices are the same as those of Hunter Water. We commit to that in our customer contracts. As the number of homes increase, a sinking fund is established so that we can renew our facilities and infrastructure. It is part of our legislative requirements to

		have sufficient funds to maintain our infrastructure so that it continues to operate at suitable standards.
	6.13 Will the sewer pumping station originally proposed for 60 Avondale Road be going ahead?	TL: No.
	6.14 Given that the system is under pressure, does this mean that it can leak untreated sewage into the soil?	TL: For our pressure sewer systems we use thick-walled HDPE piping and fusion welded joints, meaning there is much less likelihood of leakage than in traditional gravity piping systems. Our remote monitoring will identify leaks so we can fix them promptly.
	6.15 Would you be planning to intercept the current sewerage system?	TL: No, we do not plan to carry out sewer mining.
	6.16 Do you propose to harvest stormwater?	TL: If there is no benefit from it, then no we won't be doing that.
	6.17 In your application to Council, you have mentioned that this development is scalable.	TL: This refers to our plan to build this Local Water Centre in stages. <u>Additional notes:</u> The major construction phase will occur in one stage and then equipment will be added in stages.
	6.18 In your application you refer to two tanks up to 7 metres high.	TL: We have been generous in our application to Council in regards to height. Similar tanks in Pitt Town are four and a half metres high. We will be investigating suggestions made to partially sink the tanks to reduce their height.
	6.19 Is there noise or odour emitted from the site?	TL: In similar systems there is no detectable odour beyond the boundary of the property that the Local Water Centre is located. This will be investigated as part of the EIS and verified by the facility design.
	6.20 The application for 60 Avondale Road was withdrawn on the grounds of proximity to residential properties. Why are you allowing this centre to be so close to	BG: Unlike traditional treatment works (like Marconi Road, Dora Creek), the proposed facility at this site is a closed system and there are no minimum

	residential housing at this location?	distance requirements in regards proximity to residential property. At this new site, we will be developing our own residential lots around 40-50 metres from the Local Water Centre.
	6.21 What happens if we can smell it?	TL: If there are concerns about odour we will work with the community to ensure that appropriate mitigation actions are promptly taken.
	6.22 What happens if Flow Systems goes into liquidation?	TL: This is part of our licensing agreement. The Minister for Finance and Services will trigger contingency plans if we are in breach.
	6.23 What is the contingency allowance on your equipment?	TL: We have 100% contingency and redundancy allowances.
	6.24 When we have heavy rain we have discoloured water coming into the lake. Last time this happened four eels and 24 fish died.	*Comment noted.*
	6.25 You have paid $1.4 million for this property. Have you had any contact with Council and how sure are you that this rezoning will go through?	BG: We had no contact with Council prior to the acquisition of the land. The rezoning is entirely up to the Council. The cost is a development risk we are taking.
	6.26 Was this proposition put to you by Council or was it an independent decision?	BG: This system was JPG's decision and we had not spoken to Council or Hunter Water Corporation about it prior to the acquisition.
	6.27 Does Flow Systems deal with stormwater?	TL: No.
	6.28 If you have mixed biological digesters breaking down sewage, will that result in methane gas and other substances?	TL: Our system uses a membrane bioreactor not a digester system, which does not produce methane gas or other similar substances.
	6.29 What happens to synergistic and manufactured hormones that go through food and human viruses that your system isn't able to detect? What guarantees do you have to detect these?	*Question taken on notice.* Flow Systems' refined water will be free of all bacteria, protozoa and viruses. This is a condition of our operating licence, and is closely monitored by government

		regulatory bodies. Residual hormone levels in water of any quality is a global issue. It currently exists across all communities in Australia and Flow Systems is no different from any other water utility in that regard. We will work constructively with regulators to meet all license conditions, including those relating to hormones.
	6.30 If Hunter Water Corporation and Council have not encouraged JPG to go down this path, why are we not also being offered a plan through Hunter Water Corporation?	BG: Servicing the land with Hunter Water Corporation infrastructure was originally envisaged and we had Hunter Water Corporation approved servicing strategies for recycled, sewer and drinking water. But with the introduction in 2008 of WICA legislation and as new technology comes on board, a lot of developers are taking the opportunity to use private groups. BE: This is also a policy platform promoted by government.
	6.31 Why should the rest of us have to have this in our community if we do not benefit?	BG: We have to discharge sewer and produce recycled water somewhere.
	6.32 Who owns Flow Systems?	TL: We are a private company, 51 per cent owned by Brookfield Infrastructure. There are five other shareholders.
	Summary and next steps Brian Elton thanked attendees and presenters for their time. Attendees were advised that they would be able to sign up to receive the notes of the meeting and for the excursion to visit Flow Systems' Local Water Centre in Pitt Town.	

Appendix 5

EA and Reports for Concept Approval (MP 07-014) and Planning Proposal RZ-3-2014

Removed to avoid duplication. Refer to Appendix 3.5.1(a) of the Cooranbong Water Network Operator's Licence application for this document.

Appendix 6

AHIMS Search

AHIMS Web Services (AWS)
Search Result

Purchase Order/Reference : North Cooranbong

Client Service ID : 159662

RPS Australia East Pty Ltd -Hamilton

Date: 09 January 2015

Accounts Payable Fortitude Valley PO Box 237
Brisbane Queensland 4006

Attention: Lauren Vanderwyk

Email: lauren.vanderwyk@rpsgroup.com.au

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lot : 12, DP:DP1158508 with a Buffer of 0 meters, conducted by Lauren Vanderwyk on 09 January 2015.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.

A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (http://www.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Office of Environment and Heritage's Aboriginal Heritage Information Unit upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Office of Environment and Heritage and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date .Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

3 Marist Place, Parramatta NSW 2150
Locked Bag 5020 Parramatta NSW 2220
Tel: (02) 9585 6380 Fax: (02) 9873 8599

ABN 30 841 387 271
Email: ahims@environment.nsw.gov.au
Web: www.environment.nsw.gov.au

AHIMS Web Services (AWS)
Search Result

Purchase Order/Reference : 122829 PS C'Bong

Client Service ID : 155400

RPS Australia East Pty Ltd -Hamilton

Date: 21 November 2014

Accounts Payable Fortitude Valley PO Box 237
Brisbane Queensland 4006

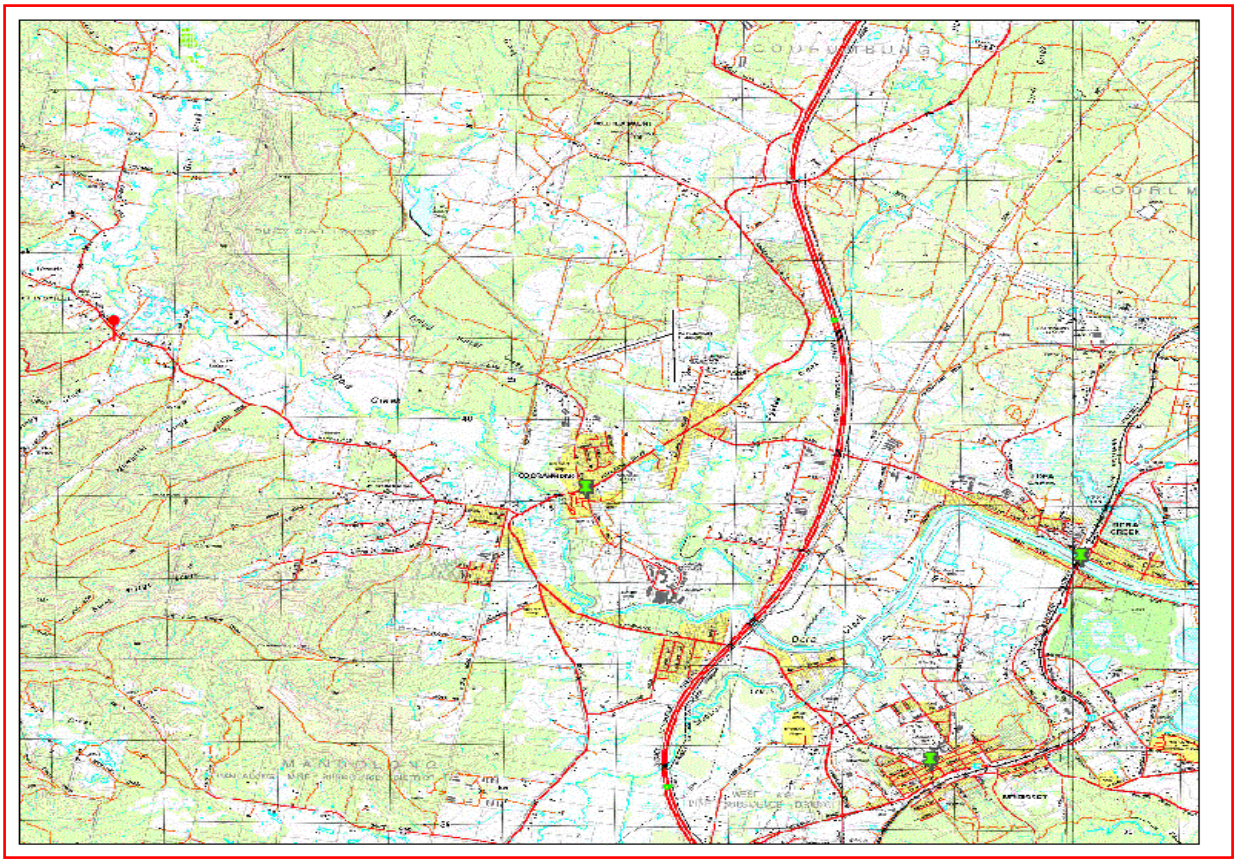
Attention: Philippa Sokol

Email: philippa.sokol@rpsgroup.com.au

Dear Sir or Madam:

AHIMS Web Service search for the following area at Datum :GDA, Zone : 56, Eastings : 350730 - 361021, Northings : 6334860 - 6344860 with a Buffer of 0 meters, conducted by Philippa Sokol on 21 November 2014.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

24	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (http://www.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Office of Environment and Heritage's Aboriginal Heritage Information Unit upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Office of Environment and Heritage and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date .Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

3 Marist Place, Parramatta NSW 2150
Locked Bag 5020 Parramatta NSW 2220
Tel: (02) 9585 6380 Fax: (02) 9873 8599

ABN 30 841 387 271
Email: ahims@environment.nsw.gov.au
Web: www.environment.nsw.gov.au

PUBLIC APPLICATION

Cooranbong Water

Appendix 3.5.1(e) Development Application and Environmental Impact Statement

flow systems

Lake Macquarie City Council

21 May 2014

JOHNSON PROPERTY GROUP PTY LIMITED
PO Box A1308
SYDNEY SOUTH NSW 1235

Attention: Mr Bryan Garland

Dear Sir

Subject: **DA/714/2014 - Utility Installation - Sewage Treatment Plant and Water Recycling Facility**
Lot 12 DP 1158508 and Lot 212 DP 1037011
615-617 Freemans Drive, COORANBONG NSW 2265

Thank you for your recent lodgement of the above application. A preliminary assessment of this application has been undertaken and to assess your application further additional information is required. This information request is issued pursuant to Clause 54 of the Environmental Planning and Assessment Regulation 2000 (the Regulation).

As acknowledged by yourself, the application is for Designated Development, however an Environmental Impact Statement (EIS) did not accompany the application. An EIS is requested.

Your response is required within 28 days from the date of this letter so that the assessment of the application may continue in a timely manner. Pursuant to Clause 109 of the Regulation, the assessment period is now stopped until your response is received.

Any information received in support of your application will be publicly available on the City's website. Third parties may access any information under the Government Information (Public Access) Act 2009. Council may also reproduce information in Council reports or in Court proceedings.

Should you require further information, please contact the undersigned on 4921 0311 or by e-mail on cbdwyer@lakemac.nsw.gov.au.

Yours faithfully

Chris Dwyer
Principal Development Planner
Development Assessment and Compliance

126-138 Main Road Speers Point NSW 2284 ● Box 1906 Hunter Region Mail Centre NSW 2310
Phone: 02 4921 0333 ● Fax: 02 4958 7257 ● ABN 81 065 027 868
council@lakemac.nsw.gov.au
www.lakemac.com.au

Our Ref: DA/714/2014

Application

For Development Consent, Construction Certificate or Complying Development Certificate

Made under the Environmental Planning and Assessment (EP&A) Act 1979

Lake Macquarie City Council
Telephone: 02 4921 0333
Facimile: 02 4958 7257
Email: council@lakemac.nsw.gov.au
Website: www.lakemac.com.au

Lodgment Options
Mail: Box 1906, Hunter Region Mail Centre, NSW 2310
In person: Customer Service Centre at 126 - 138 Main Road, Speers Point

NOTES

1. You must include all information requested on this form and the accompanying checklist, as it applies to your application. Incorrect or incomplete details may lead to delays in processing your application.
2. Attach your completed checklist to this form. Council's Customer Service Centre can assist you with any enquiries you have about completing your application.
3. At the time of lodgement, Council will calculate application fees payable.
4. Council's Privacy Management Plan is available on the City's website www.lakemac.com.au.
5. Third parties may request access to, and copies of, the information held by Council relating to this application, in accordance with the Government Information (Public Access) Act 2009.
6. **An image of this form, and any related documentation, will be publicly available on the City's website www.lakemac.com.au.**
7. **You can track the progress of your application – log on to www.lakemac.com.au/onlineservices.**
8. The *Lake Macquarie Local Environmental Plan 2004*, and *Development Control Plan No. 1* and *No. 2* are available at www.lakemac.com.au.
9. Entry onto Land: You are advised that access to your property may be required by Authorised Officers of Council in order for them to process your application and determine compliance with any consent that may be issued. By the submission of this application or by authorising its submission by another person/s it is assumed you are giving approval of entry to your premises to Council staff. Access may be made in your absence. Should access be required, staff may make contact with you beforehand to make the necessary arrangements. See Section 118 of the Environmental Planning & Assessment Act for further details.

TYPE OF APPLICATION

Indicate with a tick which type of application you are making. You can only select one of the following boxes.

☐ **Development Application (DA) and Construction Certificate (CC)**

Combined application - Application made under s.78A, s.109C(1)(b), s.81A(2), & s.81A(4) EP&A Act 1979.

For minor proposals, you may wish to apply for a DA & CC at the same time. This will save you time from submitting two applications, With two sets of plans and documentation.

☒ **Development Application (DA) only**

Application made under s.78A EP&A Act 1979.

For larger development proposals, you may wish to apply for development consent before applying for a construction certificate.

☐ **Complying Development Certificate (CDC) – Council's Provisions**

Application made under s.84A, s.85 & s.85A EP&A Act 1979.

If applying for a CDC, please check that your proposal meets all the applicable complying development criteria in the relevant Development Control Plan. If your proposal does not meet all the criteria, you may submit your application under the Codes SEPP provisions or as a Development Application.

☐ **Complying Development Certificate (CDC) – Codes SEPP Provisions**

Application made under s.84A, s.85 & s.85A EP&A Act 1979.

If applying for a CDC, please check that your proposal meets all the applicable complying development criteria in the Codes SEPP. If your proposal does not meet all the criteria, you may submit your application under Council's provisions or as a Development Application.

DESCRIPTION OF PROPOSED DEVELOPMENT

Provide the description of the proposed development as identified in the Lake Macquarie Local Environmental Plan 2004 (e.g. dwelling house, dual occupancy - attached, earthworks, home business, commercial premises, entertainment facilities, light industries).

Provide a brief description of the proposed development (e.g. commercial premises - four retail shops; hairdresser, butcher, general store, and gift shop).

UTILITY INSTALLATION FOR SEWERAGE, RECYCLED WATER AND POTABLE WATER ASSOCIATED WITH NORTH COORANBONG SUBDIVISION

If the proposal includes demolition works, please state which structures are to be demolished.

NIL

If the proposal is for staged development or you are applying for deferred commencement, provide details here.

NIL

LAND TO BE DEVELOPED

Please ensure the land to be developed is described accurately and in full.

House no(s)	Street(s)	Suburb	Lot(s)	Section(s)	DP(s)/SP(s)
617	FREEMANS DRIVE	COORANBONG	12		1158508
615	FREEMANS DRIVE	COORANBONG	212		1037011

Have you discussed your development proposal with a council officer(s)?

☒ Yes, name of officer(s) CHRIS DWYER

☐ No

APPLICANT DETAILS

Name(s)	
Company name (if applicable)	JOHNSON PROPERTY GROUP P/L
Company ACN	102 465 814
Position in company (e.g. director)	
Postal address	
House no.	PO Box A1308
Street	
Suburb	SYDNEY SOUTH
State	NSW
Postcode	1235

The following information will assist council should an officer need to contact you promptly about your application. This information is not mandatory.

Daytime phone		Mobile	0408 991 888
Fax		Email	bryang@johnsonpropertygroup.com.au

PREFERRED CONTACT METHOD

☐ Mail ☒ eMail (see note below)

I undertake to ensure that I advise Lake Macquarie City Council of any changes to my mailing/email address to ensure that all such correspondence is delivered to me without delay.

Please Note: To ensure that emails are delivered to the correct person, it is advisable that a generic email be provided.

OWNER DETAILS

Name(s)	PETER THOMSON AND BARBARA WATSON
Company name (if applicable)	
Company ACN	
Position in company (e.g. director)	
Postal address	
House no.	617
Street	FREEMANS DRIVE
Suburb	COORANBONG
State	NSW
Postcode	2265

The following information will assist council should an officer need to contact you promptly about your application. This information is not mandatory.

Daytime phone		Mobile	
Fax		Email	

BUILDER DETAILS

The following information is required for Construction Certificates and Complying Development Certificates. You may provide this information to Council later, if you have not yet appointed a builder. If you are an owner-builder, you will need to obtain an Owner-Builder Permit from the Department of Fair Trading if the value of the building works is over $5,000, prior to the release of your Construction Certificate or Complying Development Certificate.

Company name or owner builder _____

Licence or permit number _____

Postal address

House no. _____

Street _____

Suburb _____

State _____

Postcode _____

The following information will assist council should an officer need to contact you promptly about your application. This information is not mandatory.

Daytime phone _____ Mobile _____

Fax _____ Email _____

ESTIMATED COST OF WORKS

You must provide a genuine estimate of the cost for materials and labour for construction and/or demolition. Council will check your estimate against industry standard cost guides. If you understate the estimate, Council will adjust the figure and you may incur additional application fees. Please refer to Council's Guide to Estimating Cost of Works for further information.

Total estimated cost of works $ 2,500,000

Please provide the following information as it applies to your proposal.

Floor area of development - residential

Ground floor _____ m^2

First floor _____ m^2

Outbuildings _____ m^2

Total _____ m^2

Floor area of development - commercial

Gross floor area _____ m^2

Subdivision

Number of additional lots _____

INTEGRATED DEVELOPMENT

Section 91 EP&A Act 1979 - *This question only applies to Development Applications (DA).*

Integrated development refers to proposals that require development consent (from the council) and approval from one or more State Government bodies. Please refer to Council's Guide to Integrated Development to determine if this question applies to your proposal.

Is your application for integrated development?

☐ No.

☐ Yes. If yes, tick each approval below that applies to your application:

Fisheries Management Act 1994 – Department of Industry and Investment NSW (Fisheries)

☐ s.144 ☐ s.201 ☐ s.205 ☐ s.219

Heritage Act 1977 – Office of Environment and Heritage

☐ s.58

Mine Subsidence Compensation Act 1961 – Mines Subsidence Board

☐ s.15

Mining Act 1992 – NSW Department of Industry, Investment, Minerals & Petroleum

☐ s.63 & s.64

National Parks and Wildlife Act 1974 – Office of Environment and Heritage

☐ s.90

Petroleum (Onshore) Act 1991 – NSW Department of Industry, Investment, Minerals & Petroleum

☐ s.9

Protection of the Environment Operations Act 1997 – Office of Environment and Heritage

☐ s.43(a), s.47 & s.55 ☐ s.43(b), s.48 & s.55 ☐ s.43(d), s.55 & s.122

Roads Act 1993 – NSW Department of Transport - Roads & Maritime Service

☐ s.138

Rural Fires Act 1997 – NSW Rural Fire Service

☐ s.100B

Water Management Act 2000 - NSW Office of Water

☐ s.89, s.90 & s.91

SECTION 68 LOCAL GOVERNMENT ACT 1993 APPROVALS

This question only applies to development applications.

Section 68 of the Local Government Act (LGA) 1993 identifies activities that require the approval of the council.

Section 78 A (3) of the Environmental Planning and Assessment (EP&A) Act identifies the activities under section 68 of the LGA 1993 that a person may apply for approval, in the same application for development consent.

Part A - Structures or places of public entertainment

☐ 1. Install a manufactured home, moveable dwelling or associated structure on land

Part B - Water supply, sewerage and stormwater drainage work

☐ 5. Carry out stormwater drainage work

Part C - Management of waste

☐ 1. For fee or reward, transport waste over or under a public place

☐ 2. Place waste in a public place

☐ 3. Place a waste storage container in a public place

☐ 4. Dispose of waste into a sewer of the council

☐ 5. Install, construct or alter a waste treatment device or a human waste storage facility or a drain connected to any such device or facility

Part E - Public roads

☐ 1. Swing or hoist goods across or over any part of a public road by means of a lift, hoist or tackle projecting over the footway

Part F - Other activities

☐ 1. Operate a public car park

☐ 2. Operate a caravan park or camping ground

☐ 3. Operate a manufactured home estate

☐ 4. Install a domestic oil or solid fuel heating appliance, other than a portable appliance

☐ 5. Install or operate amusement devices

☑ 10. Carry out an activity prescribed by the regulations under the LGA 1993 or an activity of a class or description prescribed by the regulations

LIQUOR ACT 2007

This question only applies to development applications.

Is this proposed development on a premise that has a current/proposed liquor licence (as per the Liquor Act 2007)?

☐ Yes ☒ No

STATISTICAL DATA

The following questions apply to applications for Construction Certificates and Complying Development Certificates. This information is required For providing data to the Australian Bureau of Statistics and assists Council officers with the assessment of your application.

What is the area of land? _____ m^2

If a new building is proposed, what is the gross floor area of the building? _____ m^2

If your proposal is for a new residential dwelling:

Will the new building be attached to any existing building? _____

Will the new building be attached to any other new building? _____

Does the land contain a dual occupancy? _____

How many pre-existing units are there? _____

How many dwellings are to be demolished? _____

How many dwellings are proposed? _____

How many storeys will the building consist of? _____

Materials

Mark applicable boxes with a tick.

Walls

- ☐ Aluminium
- ☐ Brick, Double
- ☐ Brick Veneer
- ☐ Concrete, Stone or Slate
- ☐ Curtain Glass
- ☐ Fibre Cement
- ☐ Steel
- ☐ Timber
- ☐ Other

Roof

- ☐ Aluminium
- ☐ Concrete, Stone or Slate
- ☐ Fibre Cement
- ☐ Steel
- ☐ Tiles
- ☐ Other

Floor

- ☐ Concrete, Stone or Slate
- ☐ Timber
- ☐ Other

Frame

- ☐ Aluminium
- ☐ Steel
- ☐ Timber
- ☐ Other

AUTHORISATIONS

Property Owner(s)

I/we consent to the applicant identified on this form, to lodge this application with Lake Macquarie City Council (LMCC).

I/we consent to authorised officers of LMCC to access my/our property in order for them to process this application and determine compliance with any consent that the Council may issue. Access to my/our Property may occur in my/our absence (s.118 EP&A Act 1979).

Appointment of Principal Certifying Authority (PCA) - Applicable for Construction Certificates and Complying Development Certificates. Indicate with a tick which one of the following statements apply:

☐ I/we appoint Lake Macquarie City Council (LMCC) as the Principal Certifying Authority (PCA).

☐ I/we do not appoint LMCC as the PCA. At least two days prior to construction, I/we will provide LMCC with details of the appointed PCA.

☒ Not applicable. (PCA appointment is only required for Construction Certificates and Complying Development Certificates).

Name(s) ***(please print)***	REFER ATTACHED LETTER	KEITH JOHNSON - SOLE DIRECTOR AVONDALE GREENS PTY LTD
Signature(s)		

All registered property owners of the land must sign. In the case of a Company, the consent of the authorised person must be provided on letterhead.

Date 13/5/14

Applicant(s)

I/we have read the notes and instructions provided on this form, and the accompanying checklist, and have included all the requested information as it applies to this application. I/we have attached the completed checklist to this form.

Name(s) ***(please print)*** BRYAN GARLAND

Signature(s)

Date 13/5/14

DISCLOSURE OF POLITICAL DONATIONS OR GIFTS

Have you, or the organisation you represent, made any reportable political donations or gifts (see Note) within the 2 years prior to this application?

☐ Yes (Please complete a *Disclosure Statement of Political Donations or Gifts where Council is the Approval Authority* and include it with this application.)

☒ No

Please Note: For further information on Disclosure of Political Donations or Gifts goto www.legislation.nsw.gov.au and search for Political Donations. To obtain a copy of the Disclosure Statement of Political Donations or Gifts where Council is the Approval Authority contact Council's Customer Service Centre or download it from the website www.lakemac.com.au and search for Political Donations.

Cooranbong Local Water Centre

Environmental Impact Statement

Lot 12 DP1158508, 617 Freemans Drive, Cooranbong

Prepared by:

RPS AUSTRALIA EAST PTY LTD

241 Denison Street
Broadmeadow NSW 2292
PO Box 428, Hamilton NSW 2303

T: +61 2 4940 4200
F: +61 2 4961 6794
E: rob.dwyer@rpsgroup.com.au

Client Manager: Rob Dwyer
Report Number: PR122830
Version / Date: 14 August 2014

Prepared for:

JOHNSON PROPERTY GROUP PTY LTD

PO Box A1308
Sydney South NSW 1235

T: 1300 888 888

Document Status

Version	Purpose of Document	Orig	Review	Review Date
Draft	Draft for Client Review	SG / RD	RD	05 Aug 2014
Final	Submission to LMCC	SG / RD	RD	13 Aug 2014

Approval for Issue

Name	Signature	Date
Rob Dwyer		14 Aug 2014

Statement of Validity - Submission of Environmental Impact Statement (EIS) prepared under the *Environmental Planning and Assessment Act 1979*

EIS Prepared by	
a) Name	Rob Dwyer
b) Qualifications	B.Sc., Grad. Dip. URP
c) Address	241 Denison Street, Broadmeadow NSW 2292
d) In respect of	A proposed Water Recycling Facility on part Lot 12 DP 1158508, 617 Freemans Drive, Cooranbong
Development Application	
e) Proponent	Johnson Property Group Pty Ltd
f) Proponent address	PO Box A1308 Sydney South NSW 1235
Environmental Impact Statement	
	An EIS is attached.
Declaration	
Certificate	I certify that I have prepared the contents of this EIS and to the best of my knowledge ▪ It is in accordance with clauses 6 and 7 of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000;* ▪ It contains all available information that is relevant to the Environmental Assessment (EA) of the development to which this statement relates; and ▪ It is true in all material particulars and does not, by its presentation or omission of information, materially mislead.
Signature	
Name	Rob Dwyer
Date	August 14 2014

Executive Summary

Introduction and Overview

This Environmental Impact Statement (EIS) is submitted to Lake Macquarie City Council (LMCC) pursuant to Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) in support of a development application for a water recycling facility (WRF) at Cooranbong. Once approved, constructed and operating the WRF will facilitate Johnson Property Group (JPG) residential development interest of the North Cooranbong Residential Precinct which has Concept Approval (MP 07-0147). The WRF will be known as the Cooranbong Local Water Centre (Cooranbong LWC) and will be constructed, operated and maintained by private licensed water operator, known as Cooranbong Water, pursuant to licence approvals secured under the *Water Industry Competition Act 2006* (WICA).

In accordance with Section 78A (8) of the EP&A Act, the Secretary of the Department of Planning and Environment (DoPE) issued the Secretary's Environmental Assessment Requirements (SEARs) for the preparation of the EIS on 23 June 2014. This EIS has been prepared in accordance with the DoPE guidelines for the preparation of EISs and addresses the issues raised in the SEARs.

Proposed Development Description

The proposed development is to be located upon part Lot 12 DP 1158508, 617 Freemans Drive Cooranbong, and is intended to operate 24 hours, 7 days per week, housed in a low-scale, single level building within an open space setting.

The proposed development will utilise sewage from the North Cooranbong Residential Precinct produce high quality water. The proposed development will provide an alternative to the traditional sewage treatment plant usually required to service new residential developments. Off-site impacts of the proposal are limited and because it is scalable it allows supply to increase in line with the anticipated residential development of North Cooranbong Residential Precinct and the volume of waste to be treated. The Cooranbong LWC will also make a significant contribution to sustainability through the provision of recycled water (non-potable uses such as toilet flushing, washing machines, irrigation and car washing) back to the new residential areas.

Statutory and planning framework

Section 4 of the EIS considers all applicable legislation in detail. The proposed development is consistent with the requirements of all relevant State Environmental Planning Policies. Under the Lake Macquarie Local Environmental Plan 2004 the site is zoned 10 Investigation, is defined as a utility installation, is permissible with development consent and meets the objectives of the subject zone.

Environmental Impacts

This EIS provides an assessment of the environmental impacts of the proposed development in accordance with the SEARs and sets out the undertakings made by the proponent to manage and minimise potential impacts arising from the development. Some of the key matters addressed within the EIS are summarised in the following:

Flora and Fauna

The likelihood of potential impacts on species listed under the TSC Act and EPBC Act has been considered with regard to the proposed clearing of native vegetation and associated indirect impacts. As a result of all vegetation within the site potentially being removed, a small amount of habitat for threatened flora and fauna

will be lost. However, due to the wider availability of commensurate habitats within the Olney State Forest and Environmental Corridor Areas associated with the North Cooranbong Residential Precinct, and recommended mitigation measures being employed to ameliorate other direct and indirect impacts, assessments under the TSC Act and regarding MNES concluded that the proposed development is unlikely to have a significant impact on threatened species, populations or EECs.

Surface and groundwater hydrology and stormwater management

Potential soil and risks associated with the construction and operation of the proposed development are considered to be manageable, provided that appropriate mitigation controls and adaptive management measures are in place. A Concept Stormwater Management Plan will provide adequate treatment of runoff from both construction and ongoing operations.

Noise Impacts

Operational and construction noise associated with the equipment within the Cooranbong LWC has been assessed against noise criteria set out in the NSW Environment Protection Authority (EPA) NSW Industrial Noise Policy (INP).

Vibration associated with on-site construction activities has low potential to impact on receivers surrounding the site. Furthermore, road traffic noise associated with heavy vehicle movements (such as delivery of equipment, materials and concrete, etc.) on adjacent roads also has minimal impact on receivers surrounding the site. Accordingly, management of noise from construction activities is recommended to be included in the Site Construction Environmental Management Plan prepared by the successful contractor.

Predicted operational noise levels from the proposed development indicate compliance with all noise criteria on all occasions at the closest identified noise sensitive locations (both existing and future). Predicted noise level from the back-up generator, which will only operate in abnormal circumstances, also indicate compliance with the adjusted intrusive daytime noise level at the closest identified noise sensitive locations (both existing and future).

Odour and Air Quality

An Odour Impact Assessment having due consideration for the NSW Environment Protection Authority guidelines was carried out. Results from the dispersion modelling using all measured data indicated that predicted odour concentrations from the proposed development (Interim and Fully Operational) would comply with the most stringent EPA assessment criterion of 2 OU (99th percentile) at all sensitive receivers.

Further, the predicted odour concentrations are at or below 1 OU (99th percentile), the theoretical level at which odour becomes detectable but not necessarily distinguishable, at all sensitive receivers.

Mitigation Measures

Appropriate mitigation measures have been produced in response to any potential impacts that were identified as part of the EIS assessment.

Conclusion

Construction of the Cooranbong LWC will allow the provision of reticulated sewer services to the North Cooranbong Residential Precinct. Following the assessment of potential environmental impacts through the work of various specialists the EIS demonstrates that the proposed development will result in no impact beyond relevant guidelines and legislation.

Various environmental impacts (during construction) have been identified in this EIS and these are temporary in nature. Specifically, it is unlikely that the proposed development will have a significant impact on threatened species, populations and ecological communities listed pursuant to the Threatened Species Conservation Act, 1995 or impact on matters of National Environmental Significance pursuant to the Environmental Protection and Biodiversity Conservation Act, 1999. There are no long term adverse effects created by the construction or operation of the proposed development. The mitigation measures contained within the EIS, which will be implemented, will avoid or reduce the potential impacts.

The proposed development will provide a service essential for the development of the approved North Cooranbong Residential Precinct which greatly benefits the community by ensuring supply of affordable housing for the Lake Macquarie area and provides recycled water to the new development thereby reducing demand on the available drinking water supply. Therefore approval of the EIS and development application will allow the North Cooranbong Residential Precinct to be developed in a continued and timely manner, consistent with the Concept Approval (MP 07-0147).

Contents

Tables

Figures

Appendices

1.0 Introduction

This Environmental Impact Statement (EIS) is submitted to Lake Macquarie City Council (LMCC) pursuant to Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) in support of a development application for a water recycling facility (WRF) at Cooranbong. Once approved, constructed and operating the WRF will facilitate Johnson Property Group (JPG) residential development interest of the North Cooranbong Residential Precinct which has Concept Approval (MP 07-0147). The WRF will be known as the Cooranbong Local Water Centre (Cooranbong LWC) and will be constructed, operated and maintained by private licensed water operator, known as Cooranbong Water, pursuant to licence approvals secured under the *Water Industry Competition Act 2006* (WICA). A plan showing the regional location of the site subject of the EIS is shown in **Figure 1.**

The proposed development is designated development pursuant to Schedule 3 Part 1 Section 29 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) because its capacity will be greater than 2,500 persons and because the site is within 250m of an existing dwelling not associated with the development. For designated development an EIS is required to be prepared and submitted with a development application.

The EIS has been prepared by RPS on behalf of JPG, and is based on the Concept Layout and Architectural Drawings provided by Cooranbong Water as contained in **Appendix 1**, and other supporting technical information appended to the EIS as identified in the table of contents. It is noted that a separate licence application and Review of Environmental Factors has been lodged by Cooranbong Water to the Independent Pricing and Regulatory Tribunal (IPART) for the WRF. IPART is currently assessing the licence application and has the authority to recommend to the Minister for Natural Resources, Lands and Water to approve the licence application under the *Water Industry Competition Act 2006* (WICA). WICA is part of the NSW Government strategy for a sustainable water future and enable private sector innovation and investment in the water and wastewater industries. WICA enables new entrants to the industry and ensures the continued protection of public health, consumers and the environment.

This EIS has been prepared in accordance with the requirements of Part 4 of the EP&A Act, Schedule 2 of the EP&A Regulation, and the Requirements of the Secretary of the NSW Department of Planning and Environment (the SEARs) which are contained in **Appendix 2.**

This EIS should be read in conjunction with the supporting information and plans appended to and accompanying this EIS.

1.1 Overview of the Proposed Development

The proposed development, as detailed in **Appendix 1**, consists of buildings, plant and equipment that will utilise sewage from the future North Cooranbong Residential Precinct to produce high quality water. The sewage will be treated at the facility through a multi-stage process of screening, anaerobic and aerobic processing, chemical treatment, membrane filtration, ultraviolet disinfection and chlorination. A Sewage and Recycled Water Process Flow Diagram can be found in **Appendix 1.** The recycled water will be plumbed into houses for non-potable uses such as toilet flushing, washing machines, irrigation and car washing, thus reducing potable water demand. The recycled water will also be used on occasions for irrigation of areas of the JPG controlled land within the North Cooranbong Residential Precinct subject to separate negotiations and agreements between LMCC and JPG. Excess recycled water will be discharged to the existing Hunter Water Corporation (HWC) sewerage network under separate agreement.

Disclaimer: While all reasonable care has been taken to ensure the information contained on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

Figure 1: Regional Location Plan

LOCATION: Cooranbong	DATUM: GDA94 PROJECTION: MGA Zone 56
JOB NO.: **PR122830** PURPOSE: PLANNING Technician: Natalie.Wood Date: 29/07/2014	Data Sources: Client Supplied RPS

CLIENT: Flow Systems Pty Ltd

RPS AUSTRALIA EAST PTY LTD (ABN 44 140 292 762)
241 DENISON STREET BROADMEADOW PO BOX 428 HAMILTON NSW 2303
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Path: J:\JOBS\122k\122830 Cooranbong - DA and EIS\10 - Drafting\Arcgis Map Documents\122830 Figure 1 Regional Location 1 A A4.mxd

The proposed development will provide an alternative to the traditional sewage treatment plant usually required to service new residential developments. The facility will also make a significant contribution to sustainability through the provision of recycled water back to the new residential areas. Prior to commissioning and operation of the facility an interim arrangement for sewage disposal will be in place. This will collect sewage from the pressure sewerage network and discharge it to the existing HWC sewerage network possibly via interim flow balance tanks.

1.2 Background to the Proposed Development

The NSW Government introduced the WICA as part of its strategy for a sustainable water future to harness the innovation and investment potential of the private sector in the water and wastewater industries. WICA established a licensing regime for new entrants to the industry to ensure the continued protection of public health, consumers and the environment. The private sector is now encouraged to develop and operate water management schemes and the licensing system is governed by IPART.

The North Cooranbong Residential Precinct is identified in the Lower Hunter Regional Strategy 2006 as a major release area. The North Cooranbong Residential Precinct is zoned for urban development under *Lake Macquarie Local Environmental Plan 2004* (LM LEP 2004) and has Concept Approval (MP 07-0147) for up to 2,500 dwellings. Additionally two separate Voluntary Planning Agreements have been executed to manage, rehabilitate and ultimately transfer environmental conservation lands within the JPG residential development interest of the North Cooranbong Residential Precinct to LMCC and separately provide monetary contributions to offset regional ecological impacts.

An environmental assessment in support of the Concept Approval (MP 07-0147) for the North Cooranbong Residential Precinct was prepared by JPG. The Assessment established the main environmental factors for the area to be rezoned and for the current development site within that area. The conclusion of the Assessment was the area studied was suitable for a range of uses: part residential, part commercial/retail, part environmental conservation, and part open space. The Assessment and Concept Approval (MP 07-0147) were based upon HWC providing water supply and waste water servicing. However, with the introduction of WICA and the NSW Government strategy to enable private sector innovation and investment in the water and wastewater industries, an alternative to the traditional HWC method of supply is now available.

The site of the proposed development is outside the Concept Approval (MP 07-0147) area for the North Cooranbong Residential Precinct but nevertheless the proposed development is a permitted use under the current zoning as discussed further in Section 4 of the EIS.

1.3 Objectives of the Development

The objectives of the proposed development are to provide a water recycling facility that:

- Contributes to the efficient provision of essential infrastructure required to service an approved new residential community;
- Can be undertaken without an adverse impact on the environment and community; and
- Is provided in accordance with existing Government Policy.

1.4 Justification for the Development

New residential development requires the co-ordinated provision of reticulated water and sewerage services. The proposed development is seen as the best type of facility because the off-site impacts are limited; and because it is scalable and allows supply to increase in line with the anticipated residential development and

the volume of sewage to be treated. The facility also makes a significant contribution to sustainability through the provision of recycled water back to the residential area.

HWC water supply and wastewater servicing strategies for the North Cooranbong Residential Precinct were completed in 2008 and 2009. Various servicing options were considered including the transfer of wastewater flows to an existing Wastewater Treatment Plant (WWTP) in HWC's area of operation to the east of the subject site.

1.5 Alternative sites and technologies

The alternative(s) to the proposed development is to build a traditional HWC local sewage treatment plant or WWTP with potential discharge to the local waterway, or to pipe the sewage to an existing sewage treatment works for treatment and disposal. Either alternative would be more expensive, take longer to implement, have greater potential environmental impacts, and fail to achieve sustainability initiatives for water re-use.

In support of the Concept Approval (MP 07-0147) for the North Cooranbong Residential Precinct consulting engineers Parsons Brinckerhoff prepared a wastewater servicing strategy. The strategy detailed preferred options for onsite collection and offsite transfer of wastewater. One main component of the strategy was the construction of a sewer rising main from the North Cooranbong Residential Precinct that connected to the inlet works of HWCs Dora Creek WWTP. The alignment of the rising main for the most part followed Newport Road before crossing Dora Creek at the existing road bridge and following the existing road alignment to the WWTP.

JPG previously proposed the installation of a WRF at a nearby site known as 60 Avondale Road, Cooranbong as identified in **Figure 2.** The WRF used similar technology to that proposed by the current application subject of this EIS. JPG submitted a Development Application to LMCC on 3 December 2013 seeking staged development consent for the facility. The application received 58 submissions of objection and 1 petition regarding the application. The application was subsequently withdrawn. Further information regarding the previous proposal on 60 Avondale Road, Cooranbong is provided in Section 5 of the EIS.

The Cooranbong LWC option, as detailed within this EIS, delivered, operated and maintained by Cooranbong Water, was adopted by JPG as the preferred option due to limited off-site impacts, economic viability, sustainability benefits and scalable platform allowing sewerage servicing to increase in line with the anticipated residential development and the volume of sewage to be treated.

The location of the proposed development is adjacent to the North Cooranbong Residential Precinct (Concept Approval (MP 07-0147). As demonstrated within this EIS the site is not subject to constraints that represent a significant hazard. Given the need for this type of infrastructure, the type and location of the proposed development, it is assessed as providing the community with the best outcome in terms of type and location. As demonstrated by the various specialist studies that form part of the EIS a large number of mitigation measures have been developed that will either avoid or reduce the potential impacts of the proposed development.

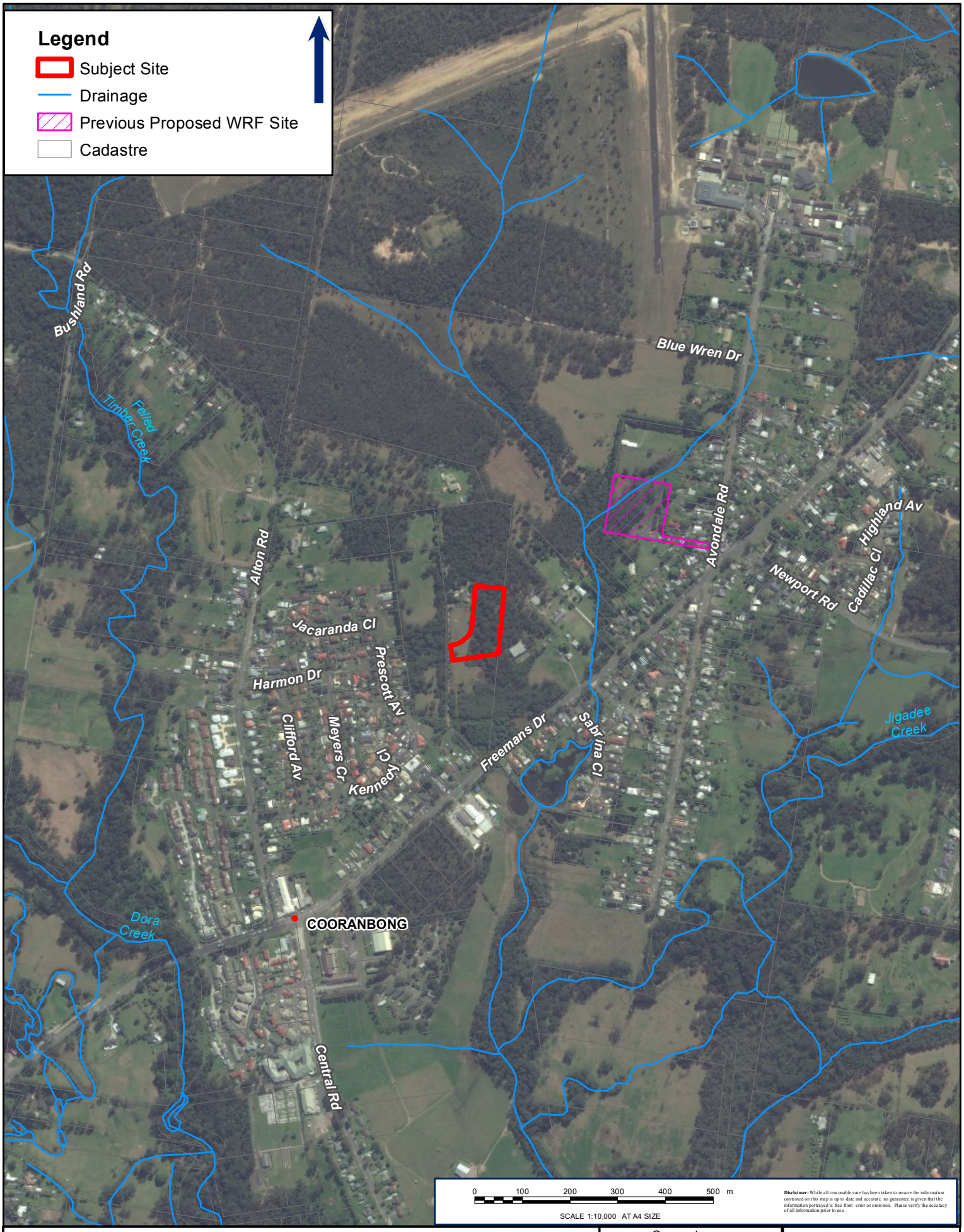

Figure 2: Regional Location and previous WRF Site plan

LOCATION: Cooranbong	DATUM: GDA94 PROJECTION: MGA Zone 56
JOB NO.: **PR122830** PURPOSE: PLANNING Technician: Natalie.Wood Date: 1/08/2014	Data Sources: Client Supplied RPS

CLIENT: Flow Systems Pty Ltd

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1.6 Secretary's Environmental Assessment Requirements

In accordance with Section 78A (8) of the EP&A Act, the Secretary of the Department of Planning and Environment (DoPE) issued the SEARs for the preparation of the EIS on 23 June 2014. A copy of the SEARs is included at **Appendix 2**.

The SEARs established that the proposed development must meet the requirements of Schedule 2 of the EP&A Act, specifically the form specifications in Clause 6 and the content specifications in Clause 7. Several stakeholders were also identified with whom consultation must occur during the preparation of the EIS.

Table 1 provides a detailed summary of the individual matters listed in the SEARs and identifies where each of these requirements has been addressed in this EIS and the accompanying technical studies.

Table 1 Outline of SEARs

Requirement	Where the issue(s) are addressed in the EIS
General	
The Environmental Impact Statement (EIS) must address the Environmental Planning and Assessment Act 1979 and meet the minimum form and content requirements in clauses 6 and 7 of Schedule 2 the Environmental Planning and Assessment Regulation 2000.	Environmental Impact Statement
Clause 6 - Form of environmental impact statement (a) the name, address and professional qualifications of the person by whom the statement is prepared, (b) the name and address of the responsible person, (c) the address of the land: (i) in respect of which the development application is to be made, or (ii) on which the activity or infrastructure to which the statement relates is to be carried out, (d) a description of the development, activity or infrastructure to which the statement relates, (e) an assessment by the person by whom the statement is prepared of the environmental impact of the development, activity or infrastructure to which the statement relates, dealing with the matters referred to in this Schedule, (f) a declaration by the person by whom the statement is prepared to the effect that: (i) the statement has been prepared in accordance with this Schedule, and (ii) the statement contains all available information that is relevant to the environmental assessment of the development, activity or infrastructure to which the statement relates, and (iii) that the information contained in the statement is neither false nor misleading.	Statement of Validity (a), (b), (c), (d), (f)
Clause 7 - Content of environmental impact statement An environmental impact statement must also include each of the following: (a) a summary of the environmental impact statement, (b) a statement of the objectives of the development, activity or infrastructure, (c) an analysis of any feasible alternatives to the carrying out of the development, activity or infrastructure, having regard to its objectives, including the consequences of not carrying out the development, activity or infrastructure, (d) an analysis of the development, activity or infrastructure, including: (i) a full description of the development, activity or infrastructure, and (ii) a general description of the environment likely to be affected by the development, activity or infrastructure, together with a detailed description of those aspects of the environment that are likely to be significantly affected, and (iii) the likely impact on the environment of the development, activity or	(a) Executive Summary provided in page iv (b) Section 1.3 (c) Section 1.5 (d)(i) Section 3 (d)(ii) Section 2 (d)(iii) Section 6 (d)(iv) Section 7 (d)(v) Section 4 (e) Section 7 (f) Section 8

Requirement	Where the issue(s) are addressed in the EIS
infrastructure, and (iv) a full description of the measures proposed to mitigate any adverse effects of the development, activity or infrastructure on the environment, and (v) a list of any approvals that must be obtained under any other Act or law before the development, activity or infrastructure may lawfully be carried out, (e) a compilation (in a single section of the environmental impact statement) of the measures referred to in item (d) (iv), (f) the reasons justifying the carrying out of the development, activity or infrastructure in the manner proposed, having regard to biophysical, economic and social considerations, including the principles of ecologically sustainable development.	
Key Issues	
A detailed description of the project	Section 3
Project justification	Section 1.4
Land use	Section 2 and Section 3
Flora and Fauna	Section 6.2 and **Appendix 4**
Heritage	Section 6.3 and 6.4 and **Appendix 5**
Surface and groundwater hydrology	Section 6.5 to 6.8 and **Appendices 6, 7, 8 and 9.**
Flooding	Section 6.5 and **Appendix 6**
Soil and Water Quality (Contamination)	Section 6.6 and **Appendix 7**
Waste generation and hazards	Section 6.14
Human health	Section 6.9
Air Quality (Odour)	Section 6.10 and **Appendix 10**
Noise and Vibration (Acoustic)	Section 6.10 and **Appendix 10.**
Traffic	Section 6.12
Visual Amenity	Section 6.13
Environmental Monitoring and Management	Section 7
Plans and Documents	
The EIS must include all relevant plans, diagrams and relevant documentation required under Schedule 1 of the Regulation. These items are to be provided as part of the EIS rather than as separate documents.	**Appendix 1**
Consultation	
Consultation with relevant parties during the preparation of the EA, including: » Local, State or Commonwealth government authorities and service providers including NSW Health, the Environment Protection Authority, the Office of Environment and Heritage, the Department of Primary Industries (including the NSW Office of Water), local catchment management authority, HWC, the Mines Subsidence Board, Roads and Maritime Services and Lake Macquarie City Council; » Specialist interest groups, including local Aboriginal land councils; and » The local community, including affected landowners.	Section 5

2.0 The Site

2.1 Site Location and Context

The location of the proposed development is shown in **Figure 1** and **Figure 3**. The site is located approximately 35 kilometres (km) south west of Newcastle, to the north-east of the existing Cooranbong village and adjoins existing residential areas of Cooranbong. The site is immediately adjacent to the southernmost area identified in the Concept Approval area (MP 07-0147) of the North Cooranbong Residential Precinct.

The site is approximately 1.44 hectares (ha) in size, approximately rectangular in shape, with access from Freemans Drive. Eventually frontage will be to a future road created via subdivision of Lot 12 DP 1158508.

The site is generally north-south facing and declines from north to south. An aerial photo of the site with contours is provided in **Figure 3**. The site can be described as vacant farming land containing grass vegetation and scattered trees.

2.2 Site Description

The following details in **Table 2** describe the subject site.

Table 2 Site description details

Descriptors	Details
Address	617 Freemans Drive, Cooranbong, NSW 2265
Lot / DP	Part of Lot 12 DP 1158508
Local Government Area (LGA)	Lake Macquarie
Locality	Cooranbong
Parish	Cooranbong
County	Northumberland
Site Area	Approximately 1.44 ha
Current Zoning	10 Investigation under LM LEP 2004

2.3 Surrounding Land Uses

To the immediate north is other land not part of the subject site but within Lot 12 DP 1158508. Much of this area is vegetated with trees. Further north of this area is cleared land that is generally zoned residential and forms future residential land.

To the immediate south is other land not part of the subject site but within Lot 12 DP 1158508. This area is adjacent to Freemans Drive.

To the east is a large lot that is predominately vegetated. It contains a dwelling in its south-eastern corner and, centrally, a large workshop shed.

To the west is vacant land that has been approved (Lake Macquarie Council DA/1574/2012) for residential subdivision purposes and is land within the Concept Approval area (MP 07-0147).

Figure 3: Site Location Plan

LOCATION: Cooranbong	DATUM: GDA94 PROJECTION: MGA Zone 56
JOB NO.: **PR122830** PURPOSE: PLANNING Technician: Natalie.Wood Date: 8/08/2014	Data Sources: Client Supplied RPS

CLIENT: Flow Systems Pty Ltd

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3.0 Description of the Proposed Development

3.1 Introduction

The proposed development will utilise sewage from the JPG controlled lands within the North Cooranbong Residential Precinct to produce high quality water. The sewage will be treated at the facility through a multi-stage process of screening, anaerobic and aerobic processing, chemical treatment, membrane filtration, ultraviolet disinfection and chlorination. The recycled water will be plumbed into houses for non-potable uses such as toilet flushing, washing machines, irrigation and car washing, thus reducing potable water demand. The facility is intended to operate 24 hours, 7 days per week, housed in a low-scale, single level building within an open space setting. The concept layout, architectural drawings and process flow diagram for the facility are contained in **Appendix 1.** The layout and architectural drawings have been used in the assessment of the proposed development by specialist consultants as detailed in Section 6 of this EIS.

The intended capacity of the facility is approximately 1,500kL per day, although it has been designed to achieve this benchmark over time in line with uptake in the residential area surrounding the development.

The features of the concept layout are as follows:

- The site, approximately 1.44 ha in size, will have permanent vehicle access from a future road created through the subdivision of Lot 12 DP 1158508. The road will connect directly to Freemans Drive at the location of a future signalised intersection;
- The site accommodates the main facility building within an enclosed structure which also includes equipment and instrumentation for operation of the treatment process;
- The facility building occupies an area of approximately 600m2;
- The site has potential to accommodate tanks for storage of recycled water (2), drinking water (2), and for chlorine (1) and the like. These will be installed on a gradual basis as the development expands;
- Hardstand areas for vehicles are provided for delivery and maintenance purposes. A service driveway and concrete hardstand is located on the western side of the operations building that will link to the new road within the subdivision. Initially, access will be via an extension to the existing gravel driveway access which will be replaced at a later stage with a permanent road pavement access via the subdivision of Lot 12 DP 1158508;
- Appropriately positioned external lighting will be provided to the external areas of the building which is configured with movement sensors and light sensors to provide additional deterrent against vandalism and graffiti. CCTV monitoring of external areas will be provided for security;
- All buildings and facilities will be designed and constructed in accordance with *Building Code of Australia* (BCA) requirements;
- Areas for soft landscaping have been provided to complement the architecture of the facility building and surrounding residential area;
- Bushfire management on the site includes the choice of material used in construction; and
- Subdivision of the site from the parent lot – being Lot 12 DP 1158508.

Features of the architectural drawings contained in **Appendix 1** are as follows:

- The design of the facility although housing an industrial type of activity is nevertheless detailed in a manner that is sympathetic to its location on the margin of a future residential area; and

- Architectural finishes and treatments range from concrete, glass and expressed steel columns/beams to colour bond steel for roofs and outbuildings, to provide a robust look to the facility but with architectural detail to integrate the facility into a residential neighbourhood. The facility is intended to present as a community asset.

Two potable water storage tanks are located in the northern part of the site. A further two tanks to store recycled water are located to the southern part of the site. Capacity is approximately 1.2 million litres each, and will stand approximately 4m high above ground level, and approximately 20m diameter. The tanks will be constructed of steel and sit in a compacted earth and gravel area.

Tanks within the facility site will be interconnected with pipes and pumps and the like to each other, and to the facility building. Pumps for potable water and recycled water tanks are to be housed in outbuildings of Colorbond material for weather and acoustic screening.

General internal access into landscaped areas and areas of retained vegetation will be deterred by low fencing. Overall access will be controlled by security fencing.

The landscape design has the following features:

- Setbacks on the eastern and southern sides of the development for bushfire management;
- A combination of hard and soft landscaping;
- An intensive area of planting centred on a contoured garden mound on the western boundary of the site to provide an effective screening of the development from future residential development, and
- A selection of plants suitable to the landscape objectives based on native species.

The facility building will have a BCA classification of Class 8. Under the BCA Class 8 is defined as:

"a laboratory, or a building in which a handicraft or process for the production, assembling, altering, repairing, packing, finishing, or cleaning of goods or produce is carried on for trade, sale, or gain."

Class 8 includes buildings used for the processing of materials for gain. However, the following considerations are relevant:

- Classes 2-9 of the BCA generally cover buildings designed for human habitation, or containing habitable rooms. The facility will only be visited for inspection or routine maintenance purpose and is not a place of employment. Frequency of visitation will be on a daily basis or less as required; and
- The public will only have access to the building by arrangement. It is anticipated that the facility will be available, via appointment, to be used by local educational establishments or as an educational resource.

The provision and standard of facilities within the building and site (eg toilets, lighting etc) will be provided as required under the BCA, and a detailed independent review and assessment will be carried out prior to commencing construction. A certification will be obtained such that the development will comply with the applicable technical provisions of NSW's building law.

Prior to commissioning and operation of the facility, an interim sewer servicing arrangement will be in place. This will collect sewage from the pressure sewerage network and then discharge it to the existing HWC sewerage network possibly via interim flow balance tanks.

This will utilise two to four temporary collection tanks (interim flow balance tanks) to collect the sewage from the pressure sewerage network for the initial lots within the scheme to be serviced by this development. Sewage may then be discharged directly to HWC's sewerage system.

The potential sources of odour from the facility are from the screens used to remove inorganic material larger than 3 mm in size, prior to treatment of the liquid flow, and which are entirely enclosed; and the vent stack of Odour Control Units (odour scrubbers) attached to Flow Balance Tanks (FBT) both permanent and interim. The goals for air quality and the performance of the proposed plant will be the same as other similar plants operating in NSW. Further discussion regarding potential odour is contained in Section 6 of this EIS.

The facility layout drawings show the proposed location for a future stormwater detention basin that is required for the residential development of the property. This EIS does not consider this stormwater detention basin as this will be detailed in future residential development applications.

3.2 Outline of Construction Works

The facility is to be located on part of Lot 12 DP 1158508. Lot 12 DP 1158508 will be subdivided in the near future to accommodate the facility on a separate allotment. The site is located on land adjacent to the southernmost area of the North Cooranbong Residential Precinct. Eventually the site will be accessed via a sealed driveway adjoining a road to be approved as part of the subdivision process however it will be accessed via an extension to the existing gravel driveway access from Freemans Drive in the interim.

The interim facility, if required, will be constructed by first clearing and grubbing the site for the facility and the access road. The land will be generally contoured to the required bulk earthworks design. A temporary hardstand area will be built for the interim flow balance tanks and temporary access road.

The facility will then be constructed once detailed designs are complete and a suitable quantity of sewage is available for commissioning of the facility.

The construction of the facility will commence with detailed excavation and installation of underslab pipework and conduits followed by traditional form, reinforcement and pouring of concrete floors and walls. The concrete tanks will be hydraulically tested and the building finished with architectural finishes. The steel storage tanks will be constructed on concrete ring beam foundations. Spoil from the construction of the facility is expected to be minimal and will be managed in accordance with a Construction Environmental Management Plan (CEMP) for the proposal. It is likely that all spoil will be used for re-contouring of the land surrounding the building and facilities.

Once the building and tanks are substantially complete, it will be equipped with mechanical, electrical and control equipment including pumps, mixers, inlet screens, odour control unit, membranes, UV disinfection and chemical dosing tanks.

3.3 Construction plant and equipment

The following plant and equipment would be required to undertake the construction of the proposed development:

- Front end loader / Chainsaws / Mulcher;
- Small tipper trucks;
- Rigid and articulated delivery trucks;
- Excavator;
- Concrete trucks;
- Cranes;
- Grader;

- Portable generators;
- Scaffold;
- Elevated work platforms; and
- General construction / building tools.

3.4 Construction Workforce

It is anticipated that the construction works would be undertaken by a work crew of 5 – 6 people over a twelve month period. All contractors and machine operators will be inducted on the environmental sensitivities of the work and relevant safeguards.

3.5 Construction Hours

The facility will be constructed during the following hours:

- Monday to Friday 7am to 6pm; and
- Sunday 8am to 1 pm.

No construction work is proposed to be undertaken on Saturdays or Public Holidays. Deliveries will not be received on Saturdays or Sundays however construction works are proposed on Sundays. If construction operations are inaudible within occupied residential properties then the work period may be extended on Sundays to 7.00am to 1.00pm.

3.6 Construction Program

Works on the interim flow balance tanks are expected to take two months, commencing in early 2015.

Construction, equipping and commissioning of the facility is expected to take approximately 12 months. Works are anticipated to begin in mid 2015 but may vary depending upon the rate of sales in the North Cooranbong Residential Precinct.

3.7 Environmental Management Plan – Construction Phase Activities

During construction environmental safeguards referred to in this EIS shall be implemented. The contractor shall prepare a CEMP covering the construction phase prior to the commencement of construction.

3.8 Outline of Operation Works

The operation of the facility will be undertaken by Cooranbong Water on the following basis:

- The facility will operate 24 hours a day, 7 days per week;
- The goods to be stored are recycled water and drinking water, which are transported by pipe system to the customers;
- Sewage may be stored in the interim flow balance tanks before discharge within 24 hours during the interim servicing period;
- Chemicals used for treatment and dosing will also be stored on site; and
- Any waste water screenings will be collected and disposed by way of an authorised waste disposal contractor.

Once operational, the plant and equipment used in the facility will include:

- Screens;
- Pumps;
- Blowers;
- Mixers;
- Compressors;
- Chemical dosing systems;
- Tanks;
- Electrical cabinets;
- Instrumentation;
- Valves and pipe work; and
- Back-up generator.

Cooranbong Water will be the private licensed water operator of the Cooranbong LWC. As part of their operations they have carried out a preliminary risk assessment of the proposed development and this is discussed in Section 6.1 of the EIS.

4.0 Strategic and Statutory Planning Framework

4.1 Commonwealth Legislation

4.1.1 Environmental Protection and Biodiversity Conservation Act 1999

Under the EPBC Act, approval by the Environment Minister is required for proposed 'actions' that have the potential to significantly impact on Matters of National Environmental Significance (MNES) or the environment of Commonwealth land. MNES of potential relevance to the proposed development include Commonwealth listed threatened species and ecological communities, and migratory species.

An EPBC Act Protected Matters Search was undertaken within the DoE on-line database (accessed May 2014) to generate a list of those Matters of National Environmental Significance (MNES) from within 10 km of the site. An assessment of those MNES relevant to biodiversity has been undertaken in accordance within *EPBC Act Policy Statement 1.1 Significant Impact Guidelines Matters of National Environmental Significance* (DoE, 2013). The Matters of National Environmental Significance protected under national environment law include:

- Listed threatened species and communities;
- Listed migratory species;
- Ramsar wetlands of international importance;
- Commonwealth marine environment;
- World heritage properties;
- National heritage places;
- The Great Barrier Reef Marine Park;
- Nuclear actions; and
- A water resource, in relation to coal seam gas development and large coal mining development.

Based upon the Flora and Fauna Assessment contained in Appendix 4 and as discussed within Section 6.2 of the EIS the following statements with respect to MNES can be made:

- Listed threatened species and communities - the proposed development is unlikely to significantly impact the above MNES species;
- Listed migratory species - it is unlikely that the proposed development over the site will impact upon any occurring or potentially occurring migratory species;
- World Heritage Properties - the site is not a World Heritage area, and is not in close proximity to any such area.
- National Heritage Places - the Site is not a National Heritage area, and is not in close proximity to any such area;
- Wetlands of International Significance (declared Ramsar wetlands) - The Ramsar listed Hunter Estuary Wetland, which comprises Kooragang Nature Reserve and Shortland Wetlands, is located approximately 39 km north east of the Site. The proposed activity of clearing is not expected to have an impact on any connected body of water; therefore the proposed development will not impact upon the Hunter Estuary Wetland.
- Great Barrier Reef Marine Parks - The site is not part of or within close proximity to any Great Barrier Reef Marine Park.

- Commonwealth Marine Areas - The site is not part of or within close proximity to any Commonwealth Marine Area.
- One Threatened Ecological Communities (TEC) listed under the EPBC Act is listed to occur within 10km occur on the Site, being Subtropical and Temperate Coastal Saltmarsh. This TEC does not occur on the site.

4.2 New South Wales Legislation

4.2.1 Environmental Planning and Assessment Act 1979 and EP&A Act Regulations 2000

The proposed development is designated development pursuant to Schedule 3 Part 1 Section 29 of the EP&A Act Regulations 2000 because its capacity will be greater than 2,500 persons and because the site is within 250m of an existing dwelling not associated with the development. A copy of the Secretary of the NSW Department of Planning and Environment requirements (the SEARs) for the proposed development are contained in **Appendix 2.**

4.3 Environmental Planning Instruments

4.3.1 State Environmental Planning Policy (Major Development) 2005

The *State Environmental Planning Policy* (SEPP) (Major Development) Amendment 2008 (North Cooranbong) was published in the Government Gazette on 5 December 2008.

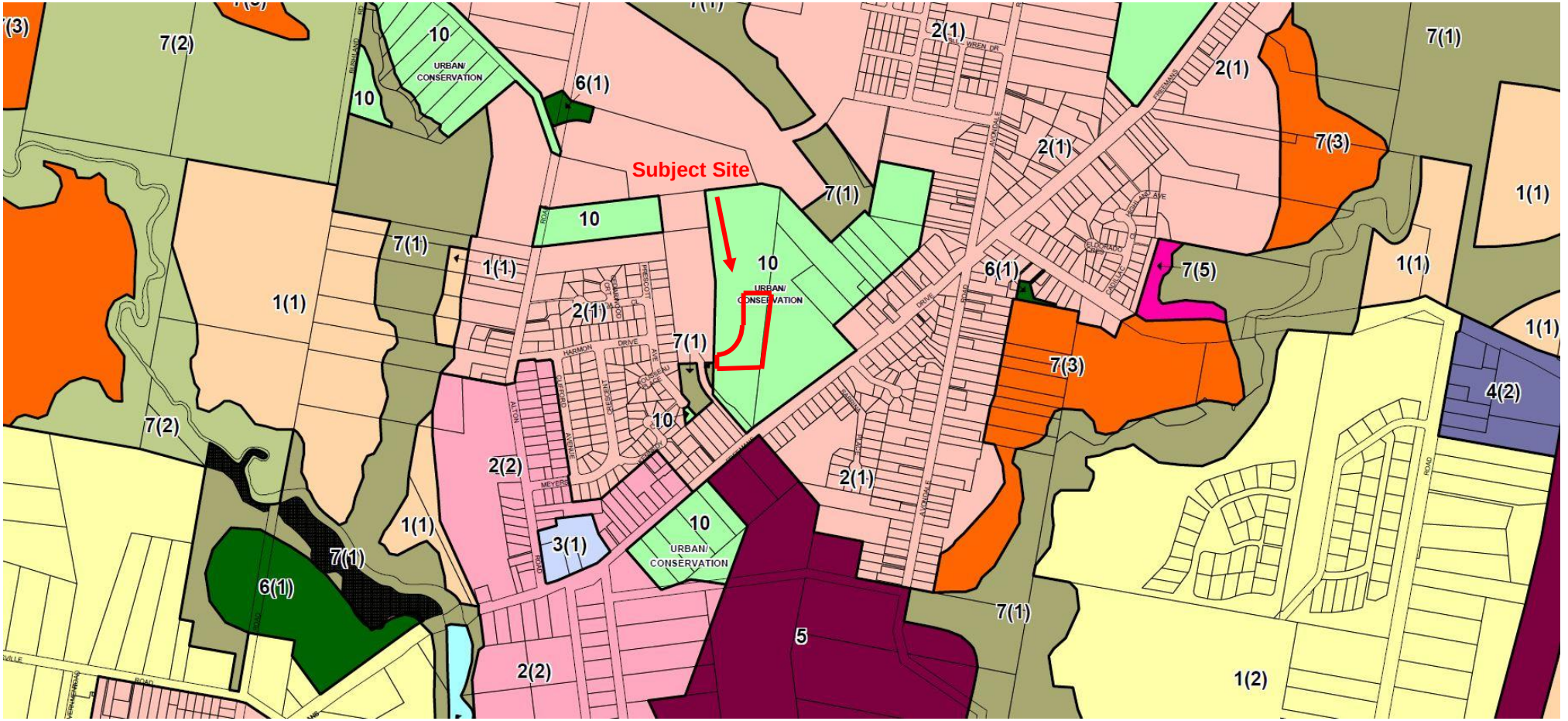
The Amendment, as part of the Part 3A Concept Approval for the North Cooranbong Residential Precinct, under *Lake Macquarie Local Environmental Plan 2004* (LM LEP 2004), rezoned land to the north and west of Cooranbong to a mix of 2(1) Residential, 2(2) Residential (Urban Living), 3(2) Urban Centre (Support), 5 Infrastructure, 6(1) Open Space, 7(1) Conservation (Primary) and 10 Investigation (Urban Conservation) zones. A zoning plan extract from the LM LEP 2004 is contained in **Figure 4**.

The above zonings and Part 3A Concept Approval (as modified) provide for:

- Up to 2,500 dwellings in residential zones covering up to 201 hectares;
- 2.75 ha for commercial development;
- 17.70 ha hectares for schools (existing and proposed);
- 15.25 ha for public open space / recreation and community facilities; and
- 119.13 ha for environmental protection.

As can been seen from viewing **Figure 4**, the Cooranbong LWC site is immediately adjacent to an area zoned 2(1) Residential and itself is zoned 10 Investigation (Urban Conservation).

Figure 4 Land zoning map – LM LEP 2004



4.3.2 State Environmental Planning Policy (Infrastructure) 2007

The SEPP (Infrastructure) 2007 (ISEPP) provides a planning regime for infrastructure and the provision of services across NSW, along with providing for consultation with relevant public authorities during the assessment process. The ISEPP supports greater flexibility in the location of infrastructure and service facilities along with improved regulatory certainty and efficiency. ISEPP is not applicable to the proposed development.

4.3.3 State Environmental Planning Policy No. 55 – Remediation of Land

The objective of SEPP 55 – Remediation of Land is to promote the remediation of contaminated land for the purpose of reducing risk of harm to human health or any other aspect of the environment. Clause 7 of the SEPP relates to development applications. That is, a consent authority must firstly consider whether a site is contaminated. If the land is contaminated, the consent authority must be satisfied that the land is suitable in its contaminated state, or it will be suitable after remediation, for the proposed development.

A Preliminary Contamination Assessment has been prepared and is discussed further in Section 6 of the EIS. The Preliminary Contamination Assessment concluded that there was no indication of gross contamination on the site. The Assessment also concluded that the site would be suitable for development as suggested by the EIS.

4.3.4 State Environmental Planning Policy No. 33 – Hazardous and Offensive Development

State Environmental Planning Policy No. 33 - Hazardous and Offensive Development (SEPP 33) is a systematic approach for assessing development proposals for potentially hazardous and offensive industry or storage. SEPP 33 introduces performance-based definitions of 'hazardous' and 'offensive' and sets out specific assessment requirements for such proposals. SEPP 33 ensures that only proposals which are suitably located, and able to demonstrate they can be built and operated without posing a significant offsite risk, can proceed.

For development proposals categorised as 'potentially hazardous industry' the policy requires applicants to prepare a preliminary hazard analysis to support the development application by demonstrating that risk levels do not preclude approval.

The proposed development is not considered to be a hazardous and offensive industry and SEPP 33 does not apply. However in accordance with best practice a preliminary risk assessment has been carried out by Cooranbong Water and is discussed further in Section 6 of the EIS.

4.3.5 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) has been considered in the preparation of this application and it is considered that this Act does not apply. The information within this EIS clearly demonstrates that the proposed development can be operated whilst complying with the POEO Act.

4.3.6 Lake Macquarie Local Environmental Plan 2004

LM LEP 2004 is a legal document that provides rules and guidelines for development within the Lake Macquarie LGA to control the use of private and public land through zoning. Although the provisions of an LEP do need to be considered for development assessed under Part 5 of the EP & A Act, the zoning provisions have been considered below to demonstrate the compatibility of the proposed development with the land use zones. As can be seen in **Figure 4** the site is zoned Zone 10 Investigation (Urban

Conservation). The objectives and permitted and prohibited uses of Zone 10 Investigation (Urban Conservation) are detailed below.

Zone 10 Investigation Zone

1 Objectives of zone

The objectives of this zone are to:

(a) provide land for future development and/or conservation, and

(b) ensure that land in this zone is thoroughly assessed to identify and substantiate future uses, and

(c) provide for limited development of the land and allow that development only where it can be proven not to prejudice or have the potential to prejudice future protection or use of the land, and

(d) ensure that land is released in a strategic and efficient manner consistent with the Lifestyle 2020 Strategy, and

(e) require comprehensive local environmental studies to substantiate the capability and suitability of land in this zone proposed for rezoning, and

(f) provide for sustainable water cycle management.

2 Without development consent

Exempt development as provided in Schedule 1.

3 Only with development consent

Development for the purpose of:

agriculture (other than intensive agriculture), bed and breakfast accommodation, drainage, dwelling houses, earthworks, emergency services facilities, environmental facilities, home businesses, home industries, roads, roadside stalls, signs, stormwater management facilities, telecommunications facilities, and utility installations.

4 Prohibited

Development not listed in item 2 or 3.

Under LM LEP 2004 the Cooranbong LWC is defined as a utility installation and is permissible with development consent. The development is considered a “designated development” under Schedule 3 of the *Environment Protection and Assessment Regulation 2000* as discussed in Section 4.2.1.

Table 3 sets out an assessment of the proposed development against the applicable provisions of LM LEP 2004.

Table 3 Assessment against LM LEP 2004

LEP Provision	Assessment	Consistency
Clause 3 Objective of Plan	The proposed development aims to ensure that new residential development within the North Cooranbong Residential Precinct is provided with essential infrastructure in a sustainable manner without causing undue burden on the existing utilities. The proposed development co-locates utility infrastructure on the same land, thereby optimising land use activities. The utility infrastructure is funded by the North Cooranbong residential development (JPG controlled lots) and therefore does not place unjustifiable economic	Consistent
Clause 14 Aims of Lifestyle 2020 Strategy		Consistent

LEP Provision	Assessment	Consistency
	burden on the greater community or HWC.	
Clause 15 10 Investigation Zone Objectives ▪ Provide land for future development and/or conservation, and ▪ Ensure that land in this zone is thoroughly assessed to ▪ identify and substantiate future uses, and ▪ Provide for limited development of the land and allow that development only where it can be proven not to prejudice or have the potential to prejudice future protection or use of the land, and ▪ Ensure that land is released in a strategic and efficient manner consistent with the Lifestyle 2020 Strategy, and Require comprehensive local environmental studies to substantiate the capability and suitability of land in this zone proposed for rezoning, and ▪ Provide for sustainable water cycle management.	The proposed development is permissible in the 10 Investigation Zone, subject to the consent of Council. The proposed development is positioned to minimise environmental impact as demonstrated elsewhere in this EIS. The development of this part of the land does not prejudice the future opportunities of the land for a combination of environmental and residential activities. The proposed development is considered to be consistent with the Lifestyle 2020 Strategy in that its implementation will effectively allow the continued release of residential land to meet the housing supply needs of Lake Macquarie and the Lower Hunter Region, consistent with State Government Planning policies. Information provided within the EIS show the capability and suitability of this land use activity within the existing zone. The development application is for a utility installation that includes sewage treatment and the recycling of treated water to produce high quality water. The sewage will be treated at the facility to provide recycled water plumbed into houses for non-potable uses such as toilet flushing, washing machines, irrigation and car washing, thus reducing potable water demand.	Consistent
Clause 16 Development Consent – matters for consideration	The proposed development has had regard to the provisions of the Lifestyle 2020 Strategy and also the zone provisions. The proposed development is considered to be consistent with both.	Consistent
Clause 17 Provision of Essential Infrastructure	The proposed development seeks the establishment of a utility installation on the land to service the 2,500 JPG controlled lots within the North Cooranbong Residential Precinct. It is expected that NBN telecommunication infrastructure will be extended from the North Cooranbong subdivision to service this site. It is also noted that HWC and Cooranbong Water have commenced negotiations regarding the establishment of a utility-to-utility services agreement which will outline how each utility authority will operate with each other.	Consistent
Clause 29 Building Heights	The facility building is approximately 6m high whilst the utility storage tanks are nominally 7m high. Therefore all buildings and structures are expected to be below 8m high as outlined in Clause 29.	Consistent
Clause 30 Control of Pollution	The potential sources of odour from the proposed development are from the screens used to remove inorganic material larger than 3 mm	Consistent

LEP Provision	Assessment	Consistency
	in size, prior to treatment of the liquid flow, and which are entirely enclosed; and the vent stack of the Odour Control Units (odour scrubbers) attached to the FBT both permanent and interim. The goals for air quality and the performance of the proposed plant will be the same as other similar plants operating in NSW. Further discussion regarding potential odour is contained in Section 6 of this EIS. The proposed development facility is predominately enclosed hence noise generation is known to be very small. However, a site specific noise assessment has been completed and is discussed in detail in Section 6.	
Clause 31 Erosion and Sediment Control	Details of erosion and sediment control will be outlined in a Construction Environmental Management Plan to be provided in the future Construction Certificate application relating to the utility installation. It is expected that erosion and sediment control will be addressed on site utilising best practice techniques. Nevertheless a Stormwater Concept Strategy has been prepared and is discussed further in Section 6.	Consistent
Clause 32 Flood Prone Land	The proposed development site is situated on elevated land above the 1:100 year flood level.	Consistent
Clause 33 Bushfire Considerations	The proposed development is not for residential purposes and therefore compliance with the specifications and requirements of Planning for Bushfire Protection (PBP 2006) do not strictly apply, however the objectives of Planning for Bushfire Protection 2006 must be considered. The building and infrastructure will be positioned to ensure that there is a defendable space surrounding the buildings without compromising the ecological corridor that links through, and adjoins the site. The facility will have a suitable access and egress for emergency service personnel. The utility installation will provide adequate infrastructure to meet the needs of fire fighters. A bushfire risk assessment has been prepared and is discussed further in Section 6.	Consistent
Clause 34 Trees and Native Vegetation	On the issue of development consent for the proposed development, trees will be able to be cleared to allow construction. The removal of trees has been considered and is discussed in detail in Section 6.	Consistent
Clause 35 Acid Sulphate Soils	The proposed development is not positioned on land that is known to be affected by acid sulphate soils.	Consistent

4.3.7 Draft Lake Macquarie Local Environmental Plan 2014

Draft Lake Macquarie Local Environmental Plan 2014 (Draft LM LEP 2014) was exhibited to the public for comment between 24 September 2012 and 24 December 2012 and at the time of exhibition was referred to as Draft LM LEP 2012. Draft LM LEP 2014 has undergone a number of changes since exhibition as was adopted and referred to the NSW Department of Planning and Infrastructure for approval by the Minister in May 2013. Draft LM LEP 2014 is expected to come into effect in late 2014. Under Draft LM LEP 2014 the site is zoned Zone RU6 Transition. The objectives and permitted and prohibited uses of Zone RU6 Transition are provided on the following page.

Zone RU6 Transition

1 Objectives of zone

- To protect and maintain land that provides a transition between rural and other land uses of varying intensities or environmental sensitivities.

- To minimise conflict between land uses within this zone and land uses within adjoining zones.
- To identify land that requires environmental studies to substantiate the capability and suitability of land prior to rezoning.
- To limit development to development that will not prejudice or have the potential to prejudice future conservation and/or development of the land.

2 Permitted without consent

Exempt development as provided in Schedule 2;

3 Permitted with consent

Bed and breakfast accommodation; Drainage; Dwelling houses; Earthworks; Emergency services facilities; Environmental facilities; Extensive agriculture; Filming; Home businesses; Home industries; Roads; Roadside stalls; Signage; Telecommunications facilities.

4 Prohibited

Any other development not specified in item 2 or 3.

Under Draft LM LEP 2014 the proposed development would best be defined as a water recycling facility. A water recycling facility means *a building or place used for the treatment of sewage effluent, stormwater or waste water for use as an alternative supply to mains water, groundwater or river water (including, in particular, sewer mining works), whether the facility stands alone or is associated with other development, and includes associated:*

(a) retention structures, and

(b) treatment works, and

(c) irrigation schemes.

Pursuant to the Land Use Table within Draft LM LEP 2014, water recycling facilities are prohibited in the RU6 Transition zone. Whilst the proposed development may not be permissible in the future under the Draft LM LEP 2014 the saving provision under Clause 1.8A of Draft LM LEP 2014 allows the proposed development to be assessed as if Draft LM LEP 2014 had not commenced. It is noted that JPG has applied to LMCC to amend the Draft LM LEP 2014 to have the site zoned as SP2 (Infrastructure). The determination of the development application and this EIS is not in any way dependent on this separate re-zoning proposal.

4.3.8 Lake Macquarie Development Control Plan

The Lake Macquarie Development Control Plan No.1 (DCP No 1) is a support document for the LM LEP 2004. It provides guidance and detailed development requirements for activities within zones and localities. The document does not have specific requirements for water recycling facilities however they do contain general provisions which, where relevant, have been considered in the design of the proposed development. **Table 4** provides an assessment of the proposed development against the relevant provisions of DCP No.1

Table 4 Proposed developments' consistency with DCP No.1

DCP Provision	Assessment	Consistency
Part 1		
Clause 1.4 Objectives of DCP No. 1	The proposed development will provide an infrastructure service to the JPG controlled 2,250 North Cooranbong residential lots. This proposed development has been prepared in accordance with relevant Council provisions and DCP controls. The proposed development is consistent with the objectives of the DCP.	Consistent
Part 2		
Clause 2.1.1 Ecological Values	The impact of the proposed development on flora and fauna has been investigated and is discussed in detail in Section 6 of this EIS. A comprehensive Flora and Fauna Assessment has been prepared and is contained in **Appendix 4.**	Consistent
Clause 2.1.2 Ecological Corridors	The land is adjacent to an ecological corridor as identified within the DCP. The extent of impact of the proposed development on the ecological corridor has been investigated and is discussed in detail in Section 6 of this EIS. A comprehensive Flora and Fauna Assessment has been prepared and is contained in **Appendix 4.**	Consistent
Clause 2.1.5 Bushfire Risk	The proposed development is not for residential purposes and therefore compliance with the specifications and requirements of PBP 2006 do not strictly apply, however the objectives of Planning for PBP 2006 must be considered. The building and infrastructure will be positioned to ensure that there is a defendable space surrounding the buildings without compromising the ecological corridor that links through, and adjoins the site. The facility will have a suitable access and egress for emergency service personnel. The utility installation will provide adequate infrastructure to meet the needs of fire fighters. A bushfire risk assessment has been prepared and is discussed further in Section 6	Consistent
Clause 2.1.11 Erosion Prevention and Sediment Control	Details of erosion and sediment control will be outlined in a Construction Management Plan to be provided in the future Construction Certificate application relating to the utility installation. It is expected that erosion and sediment control will be addressed on site utilising best practice techniques. Nevertheless a Stormwater Concept Strategy has been prepared and is discussed further in Section 6.	Consistent
Clause 2.1.12 Mine Subsidence	The subject land is not subject to mine subsidence.	Consistent
Clause 2.4.1 European Heritage Items	A search of the relevant Schedules within LM LEP 2004 and Draft LM LEP 2014 identified 18 items in the Cooranbong area; however these items are located 500 metres and more from the site and therefore place no constraints for the proposed development. Therefore, the proposed development is unlikely to impact on non-aboriginal heritage at either the construction or the operational stage, and hence mitigation measures for non-aboriginal heritage are not necessary.	Consistent
Clause 2.4.3 Aboriginal Heritage Items and Sites	A Heritage Due Diligence Assessment has been carried out over the site and is discussed in detail in Section 6 of this EIS. There is no impact on Aboriginal Places or Objects or Potential Aboriginal Deposits and there is no impediment to the proposed development for Aboriginal Cultural reasons.	Consistent
Clause 2.5.1 Essential Infrastructure	This proposed development seeks the establishment of a utility installation on the land to service the 2,250 JPG controlled lots within the North Cooranbong Residential Precinct. It is expected that NBN telecommunication infrastructure will be extended from the North Cooranbong subdivision to service this site. It is also noted that HWC and Cooranbong Water have commenced negotiations regarding the establishment of a utility-to-utility services agreement which will outline how each utility authority will operate with each other.	Consistent

DCP Provision	Assessment	Consistency
Clause 2.6 Transport, Parking, Access and Servicing	The site will have permanent vehicle access from a future road created through the subdivision process. Initially connection to the facility will be made via a temporary gravel road connecting the existing driveway access off Freemans Drive in Lot 212, DP 1037011. It is noted that in the future JPG are required to upgrade and install traffic signals at the Freemans Drive intersection, pursuant to the executed North Cooranbong planning agreement. The facility will have suitable access and parking arrangements for service and delivery vehicles attending to site.	Consistent

4.3.9 Lake Macquarie Development Control Plan 2014

Lake Macquarie Development Control Plan 2014 (Version 3) was adopted by LMCC on 10 February 2014. Whilst it applies to the LGA of Lake Macquarie as covered by Draft LM LEP 2014 and any other planning instruments still operating in the Lake Macquarie LGA, it will not commence until the making of Draft LM LEP 2014 by the Minister for Planning.

Lake Macquarie Development Control Plan 2014 (Version 3) does not have specific requirements for water recycling facilities however they do contain general provisions which, where relevant, have been considered in the design of the proposed development. Essentially the relevant provisions within Lake Macquarie Development Control Plan 2014 (Version 3) are very similar to those identified and addressed in Section 4.3.8 and therefore do not require additional discussion.

4.4 Other Legislative Requirements

No specific approvals under other legislation are required for the proposal. However other state legislation relevant to the assessment of environmental impacts on the proposed development has been considered and are outlined below.

Water Management Act 2000

The *Water Management Act 2000* is administered by the NSW Office of Water. The objective of this Act is to protect watercourses from any deleterious effects as a result of works within or near such watercourses. Part 3A of the Act requires any persons undertaking works within 40 metres of a watercourse to obtain a permit. The proposed development does not require a "Controlled Activity Approval" under the *Water Management Act 2000* due to the works being located more than 40 metres from a watercourse.

Water Industry Competition Act 2006

WICA, as part of its strategy for a sustainable water future aims to harness the innovation and investment potential of the private sector in the water and wastewater industries. WICA established a licensing regime for new entrants to the industry to ensure the continued protection of public health, consumers and the environment. The private sector is now encouraged to develop and operate water management schemes and the licensing system is governed by IPART and the Minister for Finance and Services. As mentioned in Section 3 of this EIS the construction and operation of the proposed development will be undertaken by Cooranbong Water who will be licensed under the WICA. A separate licence application has been lodged with IPART by Cooranbong Water.

Contaminated Land Management Act 1997

The *Contaminated Land Management Act 1977* (CLM Act) is administered by the Office of Environment and Heritage (OEH) and local councils. It provides a regime for investigating and, where appropriate, remediating land affected by contamination which represents a significant risk of harm to human health or

the environment. The CLM Act specifies responsibilities for managing contaminated land and the role of the OEH in the assessment of contamination and the supervision of the investigation, remediation and management of contaminated sites.

No known contaminated sites will be disturbed or generated during the construction of the proposed development. The proposed development is located within an existing rural allotment and disturbance will largely be restricted to land that has been used for low key agricultural uses and rural living. A Preliminary Contamination Assessment has been prepared for the site and is discussed in further detail in Section 6 of the EIS.

Threatened Species Conservation Act 1995

Developments requiring approval from a consent authority under Part 4 of the EP&A Act or activities requiring determination or approval by a determining authority under Part 5 of the EP&A Act, are required to be assessed in accordance with the *Threatened Species Conservation Act 1995* (TSC Act).

Section 111(4) of the EP&A Act requires a determining authority to consider the effects of an activity on the following:

(a) critical habitat, and

(b) in the case of threatened species, populations and ecological communities, and their habitats, whether there is likely to be significant effect on those species, populations or ecological communities, or those habitats, and

(c) any other protected fauna or protected native plants within the meaning of the *National Parks and Wildlife Act 1974*."

Section 5A of the EP&A Act outlines seven points which must be considered in order to determine the significance of the impact of a development or activity on the habitat of threatened species, population and ecological communities, known or considered likely to occur in the study area and environs. This assessment is commonly referred to as the 'seven part test'.

An appraisal of the impact of the proposed development upon those potentially occurring TSC Act-listed species and communities was conducted and is summarised in Section 6 of this EIS. The appraisal of the impact is based upon a Flora and Fauna Assessment contained in **Appendix 4** and indicates that the proposed development will have no significant impact on threatened species, populations and ecological communities listed pursuant to the TSC Act. Further discussion of the impact of the proposed development on flora and fauna is contained in Section 6 of this EIS.

Heritage Act 1977

The *Heritage Act 1977* (Heritage Act) is concerned with the protection of scheduled heritage items, sites and relics. The NSW Heritage Office administers this Act. It is an offence under the Heritage Act to disturb any relics. Relics are defined in the Heritage Act as any item relating to European settlement that is greater than 50 years old. There are no known European heritage items identified within the site.

National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NPW Act) is relevant to the protection of Aboriginal artefacts and the protection of native flora and fauna. Consent is required under Section 90 (2) of the NPW Act to destroy an Aboriginal artefact.

An Aboriginal Due Diligence Report has been completed for the proposed development and is discussed further in Section 5 of this EIS. The report concludes that no Aboriginal objects or places are within the area and therefore an Aboriginal Impact Permit (AHIP) is not required for the proposed activity. Nevertheless consultation under the Aboriginal Cultural Heritage Consultation Requirements (DECCW 2010) and the Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (Department of Environment and Conservation 2005) is currently underway.

Rural Fires Act 1997

The site is within an area that is classified as Bushfire Prone Land, and the surrounding vegetation may represent a potential threat to the proposed development. However the proposed development does not require bushfire safety authority approval under Section 100B of the NSW Rural Fires Act 1997.

Nevertheless a Bushfire Threat Assessment has been prepared for the proposed development and considers the bushfire hazard and associated potential threats relevant to the proposed development. It outlines the minimum mitigation measures that would be required in accordance with PBP 2006, which has been adopted by the *Environmental Planning & Assessment Amendment* (Planning for Bush Fire Protection) *Regulation 2007* & the *Rural Fires Amendment Regulation 2007.* Additionally the Assessment addresses the requirements of Section 79BA of the *Environmental Planning & Assessment Act 1979*.

Buildings as contained in the proposed development are classified as Class 5 – 8 within the BCA. Therefore, the provisions of PBP 2006 do not strictly apply for the proposed development. As mentioned above the site is however within an area that is classified as Bushfire Prone Land, and the surrounding vegetation may represent a potential threat to the proposed development. On this basis the Assessment is based on industrial development. Accordingly the aims and objectives of PBP 2006 and setback measures were considered in the preparation of the Assessment.

5.0 Consultation

5.1 Previous Utility Infrastructure Proposal

JPG previously proposed the installation of a utility installation at a nearby site known as 60 Avondale Road, Cooranbong as identified in **Figure 2.** JPG submitted a Development Application to LMCC (DA/1844/2013) on 3 December 2013 seeking staged development consent for a Utility Infrastructure Facility. The application recognised that development consent was required for the Utility Installation pursuant to LM LEP 2004.

LMCC notified this application to adjoining residents, commencing 9 December 2013 and extended the notification period until 24 January 2014. LMCC received 58 submissions of objection and 1 petition regarding the application.

At their request, JPG presented the proposed utility installation at 60 Avondale Road to the 4 February 2014 Cooranbong Chamber of Commerce meeting. Approximately 200 people were in attendance at this meeting. Following this meeting, JPG decided to abandon the proposal and find an alternate site. This decision was explained at the 1 April 2014 meeting of the Cooranbong Chamber of Commerce and a letter was circulated after 7 April 2014 to approximately 500 local Cooranbong residences.

5.2 Special Interest Groups, the local community and affected landowners

JPG held a public meeting to discuss the proposed development on 617 Freemans Drive at the Cooranbong Community Hall on the evening of 27 May 2014. The public meeting was facilitated by Mr Brian Elton from Elton Consulting Pty Ltd and featured the Development Director of JPG and the Managing Director of Flow Systems. Elton Consulting produced a set of detailed meeting minutes, as contained in **Appendix 3**, which have been provided to Lake Macquarie City Council, and Department of Planning and IPART. This was an open meeting for all interested parties and the State Member, Councillors, Council staff, Department of Planning and Environment staff and HWC staff were all invited to this meeting.

RPS recently carried out a Due Diligence Assessment Report for the site. RPS is currently conducting consultation with interested aboriginal stakeholders in accordance with the Aboriginal Cultural Heritage Consultation Requirements (DECCW 2010) and the Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (Department of Environment and Conservation 2005). These procedures and guidelines require specific consultation steps to be undertaken. At the time of writing the methodology for the heritage assessment (essentially an updated Due Diligence Assessment Report supplemented with aboriginal stakeholder consultation and input) had been sent to interested parties and responses are due by the 28th August 2014.

5.3 Government Engagement

Consultation with government stakeholders has occurred, and a summary of the responses received and the responses to the issues raised are identified in **Table 6**. Copies of the government stakeholders responses are contained in **Appendix 3.**

Of particular note in **Table 5** and **Appendix 3** is the letter of support for the proposed development and the application of a licence under WICA from HWC.

Table 5 Summary of the state agency responses received

Agency	Date and type of consultation	Issues Raised	Responses to Issues Raised
NSW Health	Email sent to Philippe Porigneaux, Environmental Health Manager at New England Health. Email response received on 6 August 2014 and is contained in **Appendix 3.**	▪ Response received on 6 August 2014 indicating that NSW Health would review the EIS when on Public Exhibition through Lake Macquarie Council. Additional details relating to the description of the proposed development including a sewage and recycled water process flow diagram was provided on 7 August 2014.	Issues that could relate to the responsibilities of NSW Health are addressed at Sections 2 and 3 and at Sections 6.15 and 8.1
NSW Environmental Protection Agency (including the Office of Environment and Heritage (OEH)	Telephone conversation with Genevieve Lorang at OEH, Newcastle on 29 July 2014.	▪ OEH raised no further issues and indicated that issues identified in its letter to DoPI on 2 June 2014 will need to be addressed.	OEH issues are addressed in EIS at Section 2 and 3 and at Sections 6.2, 6.3, 6.7, 6.8, 6.9 and 6.10.
Department of Primary Industries (including the NSW Office of Water)	Email sent to Anthony Bryson at Office of Water on 3 July 2014.	▪ No response received as at 30 July 2014.	Issues that could relate to the responsibilities of Office of Water are addressed at Sections 6.2, 6.5 and 6.6.
Local Catchment Authority (Now known as the Hunter Local Land Services HLLS))	Telephone message conversation with Jesse Gollan, Senior Land Service Officer at Hunter Local Land Services on 31 July 2014. Subsequent email sent to Jesse on 1 August 2014. Email response received on 4 August 2014 and is contained in **Appendix 3.**	▪ HLLS indicated that the information had been forwarded to the relevant officers. They will handle the response and will be in touch shortly.	Issues that could relate to the responsibilities of the Hunter Local Land Council are addressed at Sections 6.2, 6.5 and 6.6.
Hunter Water Corporation (HWC)	JPG has been consulting with HWC on an ongoing basis. Letter from HWC dated 5 June 2014 is contained in **Appendix 3.**	▪ Letter of support from HWC has been received dated 5 June 2014.	Letter of support is noted.

Agency	Date and type of consultation	Issues Raised	Responses to Issues Raised
Mines Subsidence Board (MSB)	Telephone conversation with Richard Pickles and email sent on 30 July 2014. Letter from MSB dated 4 August 2014 and is contained in **Appendix 3.**	▪ Response dated 4 August 2014 states that the property is not within a proclaimed Mine Subsidence District and is not subject to any building restrictions imposed by the MSB. The property also sits outside any current mining lease.	Constraint free status with respect to building restrictions that can be imposed by the MSB is noted.
NSW Transport Roads and Maritime Services (RMS)	Email sent to Ken Saxby, Network and Safety Services Manager, RMS Newcastle Office on 7 August 2014.	▪ No response received as at 7 August 2014.	Issues of interest that could relate to the responsibilities of the RMS are addressed in Section 6.11.
Lake Macquarie City Council (LMCC)	JPG has been consulting with LMCC on an ongoing basis. RPS met with LMCC's Chris Dwyer on 9 July 2014	▪ LMCC reiterated the issues raised in their letter dated 3 June 2014.	LMCC issues are addressed in EIS at Section 2, 3 and 4 and at Sections 6.2, 6.3, 6.4, 6.9, 6.11, 6.15 and 8.1.

6.0 Environmental Assessment

This section of the EIS assesses and responds to the environmental impacts of the proposed development. It addresses the matters for consideration set out in the SEARs, refer to Section 1.6. The Mitigation Measures at Section 7 summarise the recommendations arising from the findings of this section.

The specialist assessments that are appended to this EIS form the basis of the assessment set out below. The environmental impacts during construction, operation and rehabilitation are identified as well as avoidance, mitigation and management measures.

6.1 Preliminary Risk Assessment

Cooranbong Water will be the private licensed water operator of the Cooranbong LWC. As part of their operations they have carried out a preliminary risk assessment of the proposed development. The purpose of undertaking the preliminary risk assessment was to:

- Identify potential risks that may impact the safe and reliable operation of the facility (and associated components), specifically focussed on risks associated with the following:
  - Potential impacts to public health and/or water quality
  - Environmental impacts including noise, odour and general environmental impacts
  - Operational reliability and process performance
  - Financial viability
  - Customer Service
- Identify early, potential risk mitigation/control measures that can be incorporated in the design, construction and operation of the facility in order to sufficiently mitigate these risks.
- Facilitate further dialogue with all key stakeholders to ensure all key risks associated with the proposed development are identified and effectively controlled.

The risk assessment approach adopted for conducting the preliminary risk assessment for the proposed development was consistent with the recommendations in the Australian Guidelines for Water Recycling (AGWR). The process included the following activities:

- Risk Identification – The identification of a range of risks related to the proposed development (what might happen?);
- Risk Categorisation – The categorisation of the risks into various types to aid understanding and to provide context;
- Risk Assessment – determination of the likelihood and consequence of the unmitigated/uncontrolled risk, (what is the likelihood and impact/consequence?). Details of the assessment criteria are provided in **Tables 6, 7** and **8**.
- Managing the Risk / Risk Mitigation – the identification of appropriate controls to be further developed and implemented as appropriate should the proposed development be approved to proceed (what can be done to stop it happening?); and
- Post Mitigation Risk Assessment – the reassessment of the risk following implementation of appropriate controls to ensure that the risk is sufficiently mitigated (how effective do we anticipate the controls to be?).

Table 6 Risk assessment qualitative criteria – measures of likelihood

Qualitative Measures of likelihood		
Level	**Descriptor**	**Example Description**
A	Rare	May occur only in exceptional circumstances. May occur once in 100 years.
B	Unlikely	Could occur within 20 years or in unusual circumstances.
C	Possible	Might occur or should be expected to occur within a 5 to 10 year period.
D	Likely	Will probably occur within a 1 to 5 year period
E	Almost certain	Is expected to occur with a probability of multiple occurrences within a year.

Table 7 Risk assessment qualitative criteria – measures of consequence

Qualitative Measures of Consequence		
Level	**Descriptor**	**Example description**
1	Insignificant	Insignificant impact or non-detectable.
2	Minor	Health - Minor impact for small population.
		Environment - Potentially harmful to local ecosystem with local impacts contained to site.
		Financial - Cost of event and / or rectification is less than $10K
3	Moderate	Health - Minor impact for large population.
		Environment - Potentially harmful to regional ecosystem with local impacts primarily contained to site.
		Financial - Cost of event and / or rectification is greater than $10K but less than $100K.
4	Major	Health - Major impact for small population.
		Environment - Potentially lethal impact to local ecosystem, predominantly local, but potential for off-site impacts.
		Financial - Cost of event and / or rectification is greater than $100K but less than $1,000K
5	Catastrophic	Health - Major impact for large population.
		Environment - Potentially lethal to regional ecosystem or threatened species; widespread on-site and off-site impacts.
		Financial - Cost of event and / or rectification is greater than $1,000K

Table 8 Qualitative risk estimation

Qualitative Risk Estimation					
	Consequence				
Likelihood	1 – Insignificant	2 – Minor	3 – Moderate	4 – Major	5 – Catastrophic
A - Rare	Low	Low	Low	High	High
B - Unlikely	Low	Low	Moderate	High	Very High
C - Possible	Low	Moderate	High	Very High	Very High
D - Likely	Low	Moderate	High	Very High	Very High
E – Almost Certain	Low	Moderate	High	Very High	Very High

In undertaking the preliminary risk assessment risks were identified across a number of areas as identified in **Table 9.**

Table 9 Key risks

Area	Descriptions
The Catchment	Risks associated with the catchment area including consideration of items such as contamination, volume changes, public health incidents, storage requirements, illegal discharge to sewers etc
The Sewer Network	Risks associated with the network itself including blockages, pipe or equipment failure, loss of power etc
Local Water Centre	Consideration of the potential risks associated with the operation of the treatment facility including tank and/or equipment failure, odour, noise, process risks, capacity, power failure, telemetry, vandalism, operator error, flooding etc
Recycled Water Reticulation and Use	Risks associated with the transfer of recycled water from the facility to the users and covered areas such as equipment failure, demand, unauthorised usage, water quality, power failure etc
Drinking Water Storage and Reticulation	Risks associated with the storage and distribution of potable water to users and considered areas such as equipment failure, demand, unauthorised usage, water quality, security, power failure etc.
Management	General operations management issues risks that may impact operational reliability or supply surety.

Risks for the proposed development (i.e the Cooranbong LWC) have been summarised in **Table 10**.

Table 10 Summary of preliminary risk assessment

Potential Hazard	Pre-mitigation risk	Controls	Post-mitigation (residual) risk
Inability to treat water due to process unit failure	High	▪ Duty/standby of equipment ▪ Inlet and product water buffer storage ▪ Spares of critical equipment on site ▪ Monitoring and controls ▪ Proactive maintenance regime ▪ Experienced operators ▪ Maintain Asset Protection Zones ▪ Maintain access around Cooranbong LWC for fire fighting ▪ Access to water for fire fighting ▪ Located above 1 in 100 year flood level ▪ Backup generator	Low
Product water out of specification due to process failure	Very High	▪ Production shut down ▪ Duty/standby of equipment ▪ Inlet and product water buffer storage ▪ Monitoring and controls ▪ Proactive maintenance regime ▪ Experienced operators	Low
Noise and odour	High	▪ Odour and noise modelling at planning phase ▪ Odour scrubbing ▪ Noise mitigation in building design	Moderate
Environmental spill from tank rupture	Very High	▪ Quality assurance processes in construction ▪ Isolation from stormwater drainage ▪ Experienced construction contractors and operators ▪ Monitoring of tank levels	Moderate

6.2 Flora and Fauna

RPS was engaged to prepare a Flora and Fauna Assessment for inclusion within this EIS. The Flora and Fauna Assessment is contained within **Appendix 4.**

The objective of the Assessment was to provide a description of the terrestrial and aquatic habitats available on site for both flora and fauna, determine the likelihood of occurrence of threatened species and their habitats as well as assessing the likelihood of the proposed development to have a significant impact on any threatened species, populations or ecological communities listed within the *Threatened Species Conservation Act 1995* (TSC Act) and/or *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The Assessment provides recommendations with regard to minimisation and mitigation of impacts for any ecologically significant values on site. The Assessment recognises the relevant requirements of the EP&A Act, as amended, as well as the SEARs issued for the development. Furthermore the LMCC Flora and Fauna Guidelines (V4.2, 2012) underpin the Assessment.

A summary of the key findings and recommendations is provided below.

6.2.1 Existing Environment

The site currently supports areas of cleared land, native vegetation and areas of disturbed native vegetation. Rural residential properties border the eastern, western and northern boundaries of Lot 12 DP 1158508, containing areas of vegetation and cleared land. A known history of logging and disturbance on Lot 12 DP 1158508 has resulted in a stand of relatively young canopy trees and lower species diversity in certain areas of the site.

Database searches were undertaken to identify existing records of threatened species, populations and endangered ecological communities occurring within the site and the surrounding locality. Flora and fauna surveys were undertaken across the site from May 2014.

The site contains Coastal Plains Scribbly Gum Woodland vegetation, including disturbed re-growth as well as cleared land as shown in **Figure 5.**

Two threatened flora species, namely *Angophora inopina* (Charmhaven Apple) and *Grevillea parviflora* subsp. *parviflora* (Small-leaved Grevillea) were recorded within the site during surveys. Both species are listed as Vulnerable under both the TSC Act and EPBC Act. The locations of these species are shown in **Figure 6.** Terrestrial fauna surveys across Lot 12 DP 1158508 resulted in the positive identification of two threatened fauna species, namely the Eastern Freetail Bat (*Mormopterus norfolkensis*) and the Little Bentwing Bat (*Miniopterus australis*). Both species are listed as Vulnerable under the TSC Act.

The available fauna habitat within the site is largely limited to areas of native vegetation. The trees on site offer foraging resources and potential small hollows for birds, gliders and possums. The understorey is dense in parts with Hakea and Banksia species, offering foraging species for a range of small birds and mammals. Ground debris in the form of logs, rocks and leaf litter varies throughout the vegetation on site however overall it is considered low in availability.

TITLE: FIGURE 5: VEGETATION COMMUNITIES MAP	LOCATION: COORANBONG	DATUM: GDA 94 PROJECTION: MGA ZONE 56	DATE: 12/08/2014 PURPOSE: EIS	LAYOUT REF: [illegible] VERSION (PLAN BY): JS (B A4)

CLIENT: JOHNSON PROPERTY GROUP
JOB REF: PR122894

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RPS

TITLE: FIGURE 6: THREATENED FLORA SPECIES ON SITE

LOCATION: COORANBONG

DATUM: GDA 94
PROJECTION: MGA ZONE 56

DATE: 12/08/2014
PURPOSE: EIS

LAYOUT REF:
VERSION (PLAN BY): JS (C A4)

CLIENT: JOHNSON PROPERTY GROUP
JOB REF: PR122894

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6.2.2 Potential impact

The Assessment determined that 19 threatened fauna species and five flora species listed under the TSC Act and three threatened fauna species and five threatened flora listed under the EPBC Act may possibly occur on the site.

Under the TSC Act the following species were assessed under the 7 Part Test of Significance.

Flora

- *Acacia bynoeana* (Bynoe's Wattle) (TSC Act and EPBC Act)
- *Angophora inopina* (Charmhaven Apple) (TSC Act and EPBC Act)
- *Cryptostylis hunteriana* (Leafless Tongue-orchid) (TSC Act and EPBC Act)
- *Grevillia parviflora* subsp. *parviflora* (Small-flower Grevillea) (TSC Act and EPBC Act)
- *Tetratheca juncea* (Black-eyed Susan) (TSC Act and EPBC Act)

Fauna

- Regent Honeyeater (*Anthochaera phrygia*) (TSC Act and EPBC Act)
- Gang-gang Cockatoo (*Callocephalon fimbriatum*) (TSC Act)
- Glossy Black-Cockatoo (*Calyptorhynchus lathami*) (TSC Act)
- Little Lorikeet (*Glossopsitta pusilla*) (TSC Act)
- Little Eagle (*Hieraaetus morphnoides*) (TSC Act)
- Swift Parrot (*Lathamus discolour*) (TSC Act and EPBC Act)
- Powerful Owl (*Ninox strenua*) (TSC Act)
- Masked Owl (*Tyto novaehollandiae*) (TSC Act)
- Sooty Owl (*Tyto tenebricosa*) (TSC Act)
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*) (TSC Act)
- Golden-tipped Bat (*Kerivoula papuensis*) (TSC Act)
- Little Bentwing-bat (*Miniopterus australis*) (TSC Act)
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*) (TSC Act)
- Eastern Freetail-bat (*Mormopterus norfolkensis*) (TSC Act)
- Southern Myotis (*Myotis macropus*) (TSC Act)
- Yellow-bellied Glider (*Petaurus australis*) (TSC Act)
- Squirrel Glider (*Petaurus norfolcensis*) (TSC Act)
- Grey-headed Flying-fox (*Pteropus poliocephalus*) (TSC Act and EPBC Act)
- Greater Broad-nosed Bat (*Scoteanax rueppellii*) (TSC Act)

Further details on the impacts on these individual species under the TSC Act can be viewed in Appendix 1 of the Flora and Fauna Assessment contained in **Appendix 4.** The Assessment concludes that the proposed development is unlikely to significantly impact on any of these threatened species.

Eight threatened species listed under the EPBC Act are relevant to the proposed development due to the presence of suitable habitat or being recorded within the site. Those terrestrial flora and fauna considered based on on-site habitats present are listed as follows:

Flora

- *Acacia bynoeana* (Bynoe's Wattle)
- *Angophora inopina* (Charmhaven Apple)
- *Cryptostylis hunteriana* (Leafless Tongue-orchid)
- *Grevillia parviflora* subsp. *parviflora* (Small-flower Grevillea)
- *Tetratheca juncea* (Black-eyed Susan)

Fauna

- Regent Honeyeater (*Anthochaera phrygia*)
- Swift Parrot (*Lathamus discolour*)
- Grey-headed Flying-fox (*Pteropus poliocephalus*)

Further detail on the impacts on these species under the TSC Act Assessment of Significance is provided in Appendix 1 of the Flora and Fauna Assessment contained in **Appendix 4** and concludes that the proposed development is unlikely to significantly impact the above MNES species.

No listed migratory species were recorded on site during surveys. The following species were considered as having potential to occur:

- Great Egret (*Ardea alba*)
- Cattle Egret (*Ardea ibis*)
- White-bellied Sea Eagle (*Haliaeetus leucogaster*)
- White-throated Needletail (*Hirundapus caudacutus*)
- Rainbow Bee-eater (*Merops ornatus*)
- Black-faced Monarch (*Monarcha melanopsis*)
- Spectacled Monarch (*Monarcha trivirgatus*)
- Eastern Curlew (*Numenius madagascariensis*)
- Pacific Golden Plover (*Pluvialis fulva*)
- Rufous Fantail (*Rhipidura rufifrons*)
- Painted Snipe (*Rostratula benghalensis*)

Although these species may occupy and utilise various habitats throughout the site, no habitat on site is critical to their survival. They are all highly mobile species that could essentially use the surrounding Olney State Forest and private vegetated lands in between. It is unlikely that the proposed development over the site will impact upon any occurring or potentially occurring migratory species.

The Assessment noted no Endangered Ecological Communities listed under the EPBC Act have been recorded within the site or have been identified within any areas that have potential to be affected by indirect impacts.

The Assessment also found when considering SEPP 44 that no 'Potential Koala Habitat' occurs within the site and no further assessment under SEPP 44 was required.

6.2.3 MNES

An EPBC Act Protected Matters Search was undertaken within the DoE on-line database (accessed May 2014) to generate a list of those Matters of National Environmental Significance (MNES) from within 10 km of the site. An assessment of those MNES relevant to biodiversity has been undertaken in accordance within *EPBC Act Policy Statement 1.1 Significant Impact Guidelines Matters of National Environmental Significance* (DoE, 2013). The Matters of National Environmental Significance protected under national environment law include:

- Listed threatened species and communities;
- Listed migratory species;
- Ramsar wetlands of international importance;
- Commonwealth marine environment;
- World heritage properties;
- National heritage places;
- The Great Barrier Reef Marine Park;
- Nuclear actions; and
- A water resource, in relation to coal seam gas development and large coal mining development.

Matters relating to listed threatened species and communities and listed migratory species are discussed in Section 6.2.2. In relation to the other matters listed above the following statements have been made by the Assessment:

- World Heritage Properties - the site is not a World Heritage area, and is not in close proximity to any such area.
- National Heritage Places - The Site is not a National Heritage area, and is not in close proximity to any such area;
- Wetlands of International Significance (declared Ramsar wetlands) - The Ramsar listed Hunter Estuary Wetland, which comprises Kooragang Nature Reserve and Shortland Wetlands, is located approximately 39 km north east of the Site. The proposed activity of clearing is not expected to have an impact on any connected body of water; therefore the proposed development will not impact upon the Hunter Estuary Wetland.
- Great Barrier Reef Marine Parks - The site is not part of or within close proximity to any Great Barrier Reef Marine Park.
- Commonwealth Marine Areas - The site is not part of or within close proximity to any Commonwealth Marine Area.
- One Threatened Ecological Communities (TEC) listed under the EPBC Act is listed to occur within 10km occur on the Site, being Subtropical and Temperate Coastal Saltmarsh. This TEC does not occur on the site.

6.2.4 Proposed mitigation measures

The proposed development involves the potential removal of all habitat situated within the site, resulting in a loss of 0.89 hectares of native vegetation and the removal of an additional 0.55 hectares of cleared and non native vegetation. Due to the unavoidable impacts of potentially clearing 0.89 hectares of native vegetation, mitigation measures have been developed to minimise the effects of this clearing, and thus potential indirect impacts associated with the proposed development. **Table 11** provides a summary of the potential impacts as a result of clearing and recommended mitigation measures.

Table 11 Recommended Mitigation measures

Impact	Mitigation Measures
Direct Impacts	
Impacts to flora (loss of species and habitat)	The full extent of any vegetation clearance will be clearly documented and mapped in the site's CEMP. The CEMP will prepared by the construction contractor prior to the commencement of construction.
	Materials, plant and equipment will not be stored within the drip-lines of any trees to be retained within the site.
	To prevent damage to vegetation outside the boundaries of access tracks, vehicles and machinery will be restricted to designated work areas.
	Where access tracks run alongside areas of natural bushland, protective fencing or paraweb (or similar type) fencing is to be installed along the boundaries of the track to prevent vehicles from inadvertently entering/damaging bushland.
	Degradation or disturbance to areas of water front (riparian) vegetation will be avoided to the greatest possible extent. Any such areas will be clearly identified in the CEMP.
	Where excavated soil is to be used in site restoration, it will be excavated and stockpiled in sequential layers corresponding to the existing soil profile. Topsoil and leaf litter is to be removed first and windrowed in separate stockpiles of less than 1m in height on the upslope side of excavations. Soil layers will be replaced sequentially so that the soil profile is restored as closely as possible to its pre-work status.
	All temporary erosion and sediment control devices such as silt-stop fencing will be removed from the site at the completion of the works or when the site is stabilised.
Impacts to fauna (loss of species and habitat)	Where possible, clearing activities will be timed to avoid removal of hollow-bearing trees during breeding season of threatened species.
	Placement of hollow logs and felled hollow-bearing trees within adjacent vegetation to provide additional habitat resources for terrestrial fauna.
	The clearing extents are to be clearly demarcated with temporary fencing before commencement of works.
Indirect Impacts (reduction in quality of habitats)	
Erosion and Sedimentation (further detailed in the EIS (RPS 2014))	Sediment and nutrient controls will be implemented to reduce the impacts of stormwater, erosion and sedimentation on water quality. Specific erosion and sediment controls are to be contained within the site Construction Environment Management Plan (CEMP).
	Installation of erosion and runoff control measures around cleared and operational areas.
	Clearing of vegetation is not to be undertaken during extensive or heavy rain events.
	Where excavated soil is to be used in site restoration, it will be excavated and stockpiled in sequential layers corresponding to the existing soil profile. Topsoil and leaf litter is to be removed first and windrowed in separate stockpiles. Soil layers will be replaced sequentially so that the soil profile is restored as closely as possible to its pre-work status.
	Sediment filters such as silt fences, coir logs, or turf strips will be located downstream of disturbed areas.

Impact	Mitigation Measures
Weed Incursion	The work site will be left clean from debris and other rubbish and in a manner that does not promote the growth of weeds at the end of works.
	Machines, tools and contractors to follow wash down protocols in the CEMP to limit the spread and establishment of weeds on site.

6.2.5 Conclusion

The likelihood of potential impacts on species listed under the TSC Act and EPBC Act has been considered with regard to the proposed clearing of native vegetation and associated indirect impacts. As a result of all vegetation within the site potentially being removed, a small amount of habitat for threatened flora and fauna will be lost. However, due to the wider availability of commensurate habitats within the Olney State Forest and Environmental Corridor Areas associated with the approved North Cooranbong Residential Precinct, and recommended mitigation measures being employed to ameliorate other direct and indirect impacts, assessments under the TSC Act and regarding MNES concluded that the proposed development is unlikely to have a significant impact on threatened species, populations or EECs.

6.3 Aboriginal Heritage

RPS was engaged by Cooranbong Water to prepare a Heritage Due Diligence Assessment Report for the site. This report was completed in June 2014 and was included within a review of environment factors (REF) submitted to IPART to support a licence application under WICA. The purpose of a due diligence assessment is to identify whether Aboriginal objects are present, or likely to be present on the site; to determine whether proposed activities are likely to harm Aboriginal objects (if present), and to determine whether an Aboriginal Heritage Impact Permit (AHIP) is required. Findings and recommendations from the Report dated June 2014 remain relevant for this EIS and are summarized below. The Heritage Due Diligence Assessment Report is contained in **Appendix 5** and it is noted that consultation with interested aboriginal stakeholders is currently occurring, refer to Section 6.3.4, with the results to further inform the development application process consistent with the SEARs issued for the proposed development.

6.3.1 Existing Environment

The underlying geology of the site is composed of the Narrabeen Group and Clifton Subgroup. The Munmorah Conglomerate Formations exists in the area and comprises sandstone, inter-bedded sandstone and siltstone, claystone with conglomerate and sandstone of the Widden Brook conglomerate.

The site is located on the Doyalson soil landscape. This landscape generally comprises a topsoil of up to 10cm of brown loose loamy sand which overlies 10-30cm of hard-setting bleached yellowish brown clayey sand on top of 30-60cm of earthy bright yellowish brown sandy clay loam. The earthy bright yellowish brown sandy clay loam layer will occasionally overlie up to 50cm of a massive pale grey clay.

The site is situated on a gently sloping lower slope landform with an elevation less than fifteen metres Australian Height Datum (AHD) and is located approximately 300 metres west from a second order unnamed tributary of Dora Creek. The closest permanent water source to the site is Jigadee Creek situated approximately 700 metres to the south east. Local and ephemeral water sources in the local area could have been used by Aboriginal people in the past.

A search was undertaken of the Aboriginal Heritage Information Management System (AHIMS) database for an approximate 10 kilometre radius around the site. The search revealed that there are 24 previously recorded Aboriginal sites within the 10 kilometre radius. No Aboriginal Places were identified in or near the

site as a result of the AHIMS database search. The search identified that the closest recorded Aboriginal site to the site is AHIMS#45-3-3274, an isolated artefact, approximately two kilometres to the south west.

A visual inspection of the site was conducted on Wednesday 16 April 2014 and undertaken by Philippa Sokol RPS Cultural Heritage Consultant. The visual inspection was conducted on foot (pedestrian). The visual inspection was conducted on a sunny and humid day.

It was noted that the site is situated on a lower slope landform with a very gentle slope trending in a south east direction with an open aspect.

There were no watercourses identified in the site with the closest water source being a second order tributary of Dora Creek approximately 300 metres to the east.

Ground surface exposure varied, being low in the areas that were vegetated and higher in the cleared areas that had been recently disturbed by vehicles. The approximate exposure for the site was 25% with a ground surface visibility at approximately 80%. Vegetation in the south west of the area was a dense, compact grass, with thick shrubs, vines, tall grass and scattered grass trees in the south. The remaining portions in the east comprised a canopy of mature native trees, dense melaleuca and thick shrubs. Soils in the area included a sandy loam in areas that were vegetated, occasionally with a dense organic texture, and a clayey B horizon on eroded exposures. Very little raw stone material was observed on the ground surface and no material was identified that would be considered suitable for stone tool manufacture. Disturbances included previous clearing works in the south western portion, installation of electricity poles, fencing works, churned up ground surface from vehicles in cleared area, access tracks through vegetation, a number of rubbish dump areas and ongoing erosion. Identified land uses in the site include vehicle access via tracks, dumping of rubbish and general use of cleared areas. As a result of the visual inspection no Aboriginal objects were identified. During the visual inspection it was noted that there was low to nil potential for archaeological deposit due to the high amounts of landform modification.

6.3.2 Potential Impacts

The purpose of the Due Diligence Assessment Report was to identify whether Aboriginal objects are present, or likely to be present on the site; to determine whether proposed activities are likely to harm Aboriginal objects (if present) and to determine whether an Aboriginal Heritage Impact Permit (AHIP) is required.

The results of the AHIMS search and the visual inspection indicate that there are no identified Aboriginal objects on site. As there are no identified Aboriginal objects on the site the Heritage Due Diligence Assessment Report assessed that there is no identified risk of harm to Aboriginal objects and an AHIP is not required for the proposed activity.

6.3.3 Proposed Mitigation Measures

The Due Diligence Assessment Report considered the available environmental and archaeological information for the area, the land condition, as well as, the nature of the proposed activities. The Due Diligence Assessment Report Assessment states that no Aboriginal objects or places have been identified within the area as a result of the visual inspection and as such an AHIP is not required for construction works to proceed.

However the Due Diligence Assessment Report provides the following recommendations for the proposal.

Recommendation 1

All relevant Cooranbong Water staff and contractors should be made aware of their statutory obligations for heritage under the *National Parks and Wildlife Act* 1974 and the *Heritage Act* 1977, which may be implemented as a heritage induction.

Recommendation 2

This Due Diligence Assessment Report must be kept by Cooranbong Water so that it can be presented, if needed, as a defence from prosecution under Section 86(2) of the *National Parks and Wildlife Act* 1974.

Recommendation 3

If unrecorded Aboriginal object/s are identified on the site during works, then all works in the immediate area must cease and the area should be cordoned off. OEH must be notified by ringing the Enviroline 131 555, so that the site can be adequately assessed and managed.

Recommendation 4

In the unlikely event that skeletal remains are identified, work must cease immediately in the vicinity of the remains and the area must be cordoned off. The proponent must contact the local NSW Police who will make an initial assessment as to whether the remains are part of a crime scene or possible Aboriginal remains. If the remains are thought to be Aboriginal, OEH must be contacted by ringing the Enviroline 131 555. An OEH officer will determine if the remains are Aboriginal or not; and a management plan must be developed in consultation with the relevant Aboriginal stakeholders before works recommence.

Recommendation 5

If, during the course of development works, suspected historic cultural heritage material is uncovered, work should cease in that area immediately. The Heritage Branch, OEH (Enviroline 131 555) should be notified, and works are only to recommence when an approved management strategy has been developed.

6.3.4 Consultation

RPS is currently conducting consultation with interested aboriginal stakeholders in accordance with the Aboriginal Cultural Heritage Consultation Requirements (DECCW 2010) and the Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (Department of Environment and Conservation 2005). These procedures and guidelines require the following consultation steps to be undertaken (note timeframes are statutory):

- Public advertisement of the proposed development in a local print media (10 days)
- Written notification to 7 government authorities (21 days)
- Registration of Aboriginal parties (14 days)
- Methodology for heritage assessment to be reviewed by registered Aboriginal Parties (RAPs) (28 days)
- Inspection of proposed development area with RAPs (1 day)
- Preparation of report (1 week)
- Draft report sent to RAPs and request feedback (28 days).

At the time of writing the methodology for heritage assessment had been sent to interested parties and responses are due by the 28th August 2014.

6.3.5 Conclusion

No Aboriginal objects or places have been identified within the area and therefore an Aboriginal Impact Permit (AHIP) is not required for construction and ultimately operation of the proposal.

6.4 Non-Aboriginal Heritage

6.4.1 Existing Environment

The State Heritage Inventory is maintained by the Heritage Branch of the Office of Environment & Heritage (NSW). It contains State non-Indigenous heritage information including:

- State Heritage Register
- Section 170 Heritage Items
- Locally significant items

A search of the State Heritage Inventory database on 23 May 2014 identified two items/places in the Cooranbong locality which are detailed in **Table 12.**

Table 12 Items listed on the state heritage inventory

Item	Address	Heritage Listing	Significance	Proximity to Project Area
Cottage	661 Freemans Drive, Cooranbong	State Heritage Inventory	Local	200m
House 'Three Bells'	597 Freemans Drive (west side)	State Heritage Inventory	Regional	200m

No historic heritage items were identified within the site. The local and regional historic items were the closest to the site; include a Cottage approximately 200 metres north east and the Three Bells house approximately 200 metres south west. As these two items are situated outside the site and are located at a sufficient distance that they do not place constraints for the proposed activity.

The LM LEP 2004 and Draft LM LEP 2014 provide a list of historic items that have been listed by the council as having heritage value. In some cases items of Aboriginal cultural heritage are also listed.

A search of the relevant Schedules within LM LEP 2004 and Draft LM LEP 2014 identified 18 items in the Cooranbong area; however these items are located 500 metres and more from the site and therefore place no constraints for the proposed development.

Therefore, the proposed development is unlikely to impact on non-aboriginal heritage at either the construction or the operational stage, and hence mitigation measures for non-aboriginal heritage are not necessary.

6.4.2 Conclusion

There are no non-Aboriginal heritage items located within the area to be disturbed. The proposed development is unlikely to affect identified heritage listed items in the broader vicinity.

6.5 Flooding

Hyder was engaged to prepare a Flooding Impact Assessment for the proposed development and for inclusion within this EIS. Findings and recommendations from the Assessment are summarized below and the Assessment is contained in **Appendix 6**.

6.5.1 Existing Environment

The proposed development site naturally falls to the south into Sandy Creek on the eastern side of Freemans Drive, Cooranbong. Sandy Creek is a tributary of Dora Creek.

6.5.2 Potential Impacts

In relation to flooding the SEAR's issued for the proposed development request an assessment of flood impacts to and from the facility, including constraints to detailed design and impacts on the operation of the infrastructure, and contingency measures in the event of operational impacts due to flooding.

In relation to impacts to the proposed development, standard practice in NSW, as detailed in the NSW Floodplain Development Manual is to adopt a flood planning level (FPL) of 0.5 m above the 1% Annual Exceedance Probability (AEP) flood level. In order to determine the 1% AEP flood level a flood study is typically required.

Several flood studies have been performed on the area surrounding the proposed development including:

- Flood and Drainage Assessment – Freemans Drive, Cooranbong (PPK, 2002);
- Flood Investigation Assessment for North Cooranbong Investigation Area (Northrop, 2005); and
- North Cooranbong Flooding and Stormwater Master Plan (Hyder Consulting, 2008).

These studies have highlighted a problem with localised flooding between the south of the site and Freemans Drive. The PPK study (2002) showed water ponding in this location up to R.L 5.9 in the 1% AEP event. This work was continued by Northrop (2005) which concluded that the ponding reached R.L 4.2 in the 1% AEP event.

Hyder Consulting's study (2008) was undertaken to inform the design of a regional detention system for development of the North Cooranbong Precinct and, while the study did not extend as far south as the proposed LWC, it found flows to be similar to those reported by Northrop (2005). This provides some level of confidence in the 1% AEP flood level reported by Northrop of R.L 4.2.

As the proposed development site is at R.L 8.0 at its lowest point, assuming local overland flows are contained within the road reserve along the western edge of the site, the Assessment concludes that there are no impacts on the site due to flooding in the 1% AEP event.

The Assessment notes the lack of information on the Probable Maximum Flood (PMF) levels at the site. However, given the significant difference between the lowest point in the facility (R.L. 8.0) and the most recent estimate of the 1% AEP level (R.L. 4.2) the Assessment considers it unlikely the PMF level would impact the facility.

In relation to impacts from the proposed development the likely impacts can be measured as any change to the flood levels downstream of the proposed development and again it is standard practice in NSW for this impact to be measured for the 1% AEP event.

The facility itself will drain into a regional detention basin directly to the south, as discussed in the Concept Stormwater Management Strategy in Section 6.7 of this EIS. The Assessment correctly assumes this basin has been sized to incorporate the proposed development and it will provide sufficient storage such that flood levels downstream of the basin will be as though the catchments upstream were completely undeveloped in all events up to and including the 1% AEP. The Assessment accordingly states that this means that there are no flooding impacts from the facility.

6.5.3 Conclusion

The Assessment concludes there are no impacts to or from the facility in terms of flooding, and there are also no constraints imposed on the detailed design of operation of the facility. In an extreme flood event, evacuation could proceed safely to the higher ground to the north of the site. The Assessment states the flooding impacts to and from the facility and the design constraints imposed by them have been found to be negligible.

6.6 Contamination

Cardno was engaged to prepare a Preliminary Geotechnical Investigation and Preliminary Contamination Assessment for the proposed development and for inclusion within this EIS. Findings and recommendations from the Investigation and Assessment are summarized below and both documents are contained in **Appendix 7**.

6.6.1 Existing Environment

The Investigation notes the site is bounded by bushland to the north, south and east and has cleared open space to the west. Topographically the site is located on the southern slope of a broad east-west trending ridgeline and slopes to the south at approximately 6°. Drainage would be expected to comprise surface runoff following the natural contours of the site to the south.

Reference to the 1:100,000 Newcastle Coalfield Regional Geology Map indicate that the site is situated within the Munmorah Conglomerate of the Narrabeen Group. The subgroup typically comprises conglomerate, pebbly sandstone and grey to green shale and residual soils derived there from.

Geotechnical Conditions

A field investigation was conducted on 16 June 2014 by suitably qualified personnel using a 3.5 tonne excavator equipped with a 450mm toothed bucket, and comprised excavation of three (3) Test Pits to target depths of 1.5 m or prior refusal. Dynamic Cone Penetrometer testing was conducted adjacent to the bores by a Senior Laboratory Technician to aid in the assessment of the subsurface strength conditions.

The subsurface conditions encountered in the bores drilled across the site comprised of:

- Silty Sand Topsoil to between 0.1 to 0.2m overlying;
- Clayey Sand to between 0.5 and 0.7m depth overlying; and
- Silty Sandy Clay to at least 1.5m depth.

Some evidence of weathered rock was observed at the base of one test pit. Penetrometer testing indicates the clayey sand observed is loose to medium dense and the silty sandy clay is of a stiff to hard consistency and was assessed to be above the plastic limit at the time of fieldwork.

No groundwater or seepage was encountered in the bores at the time of fieldwork; however, the Investigation Report noted that groundwater levels are likely to fluctuate with variations in climatic and site conditions.

Conclusions from the Investigation Report revealed a subsurface profile generally comprising silty sand topsoil overlying clayey sand and residual silty sandy clays grading to potential weathered rock.

Footings founded in controlled fill or natural and founded in stiff to very stiff (minimum undrained cohesion of 75kPa) may be proportioned on an allowable bearing pressure of 150kPa. Piered footings founded in

controlled and founded in stiff to very stiff (minimum undrained cohesion of 75kPa) could be proportioned on an allowable bearing pressure of 300kPa if founded at a minimum depth of 2m. Inspection of footings by a geotechnical consultant or experienced engineer is required to provide confirmation of founding conditions.

Materials excavated on site with the exception of topsoil, silt and other deleterious materials, are considered suitable for re-use as engineering fill.

The Investigation Report states that there were no significant geotechnical constraints to the proposed development encountered on the site during the investigation. It noted that several large tanks will be constructed as part of the development which may be sensitive to differential movement. It is recommend that additional assessment would be prudent in the specific location of the tanks to assess any design issues arising from the existing conditions and proposed earthworks.

Preliminary Contamination Assessment

The Preliminary Contamination Assessment was conducted in accordance with the National Environment Protection (Assessment of Site Contamination) Measure 2013 with the scope of works including the following tasks:

- Undertaking site history and background reviews;
- Undertaking a site inspection;
- A limited program of targeted intrusive testing; and
- Laboratory testing of bulk and disturbed samples.

The site inspection and targeted sampling was conducted on 31 July 2014 by suitably qualified personnel.

The site history and background review along with the site inspection identified possible contamination associated with:

- Potential herbicide and pesticide used on site;
- Potential contamination associated with isolated dumping of household items, building rubble such as bricks and tiles in proximity to the western boundary of the site;
- Previous structures; and
- Potential onsite filling.

As a result targeted instrusive testing was undertaken on the site and laboratory testing was carried out on the soil samples. Laboratory analysis considered heavy metals, hydrocarbons, polycyclic aromatic hydrocarbons, organophosphorus pesticides, polychlorinated biphenyls, organochlorine pesticides, and asbestos.

Based on the fieldwork and laboratory findings and comparison of the analytical testing undertaken to threshold limits detailed in the National Environment Protection (Assessment of Site Contamination) Measure 2013 the Preliminary Contamination Assessment concluded that there was no indication of gross contamination on the site. The Assessment also concluded that the site would be suitable for development as suggested by the EIS.

6.6.2 Conclusion

As detailed in Section 6.7 of the EIS, there is unlikely to be any contamination resulting from the operational output of the Cooranbong LWC. It is anticipated that the nutrient loads in the recycled water will have no

appreciable impact on environmental and / or public health. The Preliminary Contamination Assessment concluded that there was no indication of gross contamination on the site and the site would be suitable for development as suggested by the EIS.

6.7 Stormwater Management Strategy

Northrop was engaged to prepare a Concept Stormwater Management Strategy for the proposed development and for inclusion within this EIS. Findings and recommendations from the Strategy are summarized below and the Strategy is contained in **Appendix 8**.

6.7.1 Existing Environment

The site is situated on a lower slope landform with a very gentle slope trending in a south east direction with an open aspect. The landscape has been previously modified by some vegetation clearing.

The Concept Stormwater Management Strategy notes a number of key features including:

- The site is approximately 1.44 ha in area;
- The LWC building occupies an area of approximately 600m2;
- The external hardstand occupies an area of approximately 1500m2;
- The external plant and equipment (e.g., tanks) occupies an area of approximately 1600m2;
- Significant areas for soft landscaping have been provided in and around the facility; and
- The site is proposed to have permanent vehicle access from a future road created through the subdivision process associated with the North Cooranbong land release. A fire trail access will also be provided.

6.7.2 Potential Impacts

The Strategy compares the roof area, road and car park area and landscape area of the proposal against the same predicted by an equivalent residential development and concludes that the runoff regime from the proposal is considered to be less than that produced from an equivalent residential development. Accordingly the proposal is compliant with, albeit much lower than, the anticipated runoff regime of the residential zoning which is the basis of the regional stormwater management modelling/design carried out for the North Cooranbong Residential Precinct.

6.7.3 Proposed Mitigation Measures

The Concept Plan incorporates a range of water sensitive and industry best practice management measures with the endeavour of further improving water quality onsite whilst harnessing the synergy of providing water quality treatment, flow retention and passive irrigation. No onsite detention is required or proposed for the LWC, although the proposed site management strategy will provide additional flow retention over and above that required. The Concept Plan has been compiled in accordance with the Landcom Managing Urban Stormwater – Soils and Construction (the Blue Book).

Furthermore, loading areas or areas where potential spillage could occur will be isolated and additional treatment measures will be employed. Such system will be incorporated in to the detailed design to reflect the sites handling and operational procedures.

A range of control measures to eliminate, limit or mitigate impacts from construction activities have been proposed. These measures will be contained in the CEMP for the works and will include the following

- Mulch bunds up slope of the proposed disturbance areas;
- Coir logs at 15m centres within the proposed road side swales;
- Sediment fences down slope of all disturbed areas and material stockpile areas;
- Disturbed areas will be stabilised by revegetation within 10 days after completion of construction.
- Site disturbance will be minimised by containing machinery access to site areas required for approved construction works.
- Erosion potential would be limited by managing runoff fetches and velocities, with measures such as contour drains, silt fences and level spreaders
- Sediment filters such as silt fences, coir logs, or turf strips will be located downstream of disturbed areas.
- The storage and handling of fuels and chemicals shall comply with Australian Standard AS1940.
- No chemicals, fuels, and/or waste will be stored or collected for disposal within or adjacent to drainage lines or unsealed surfaces.
- A 'spill kit' will be kept on site at all times for potential chemical or fuel spills.
- Refuelling, fuel decanting and vehicle maintenance work will take place in a designated sealed and bunded area.
- An Incident Management Plan (IMP) will be prepared as part of the CEMP and will include a contingency plan and emergency procedures for dealing with the potential spillage of fuel or other environmental incidents that may occur on the work site. The IMP should also contain procedures dealing with the unexpected onset of rainfall during the work period.
- Appropriate containment measures will be used to ensure that all drilling fluids from directional drilling or boring activities are captured and contained.
- Drainage systems will be checked at regular intervals and maintained to ensure they are operating at full capacity (eg clearance of debris from drainage lines).

6.7.4 Conclusion

The Concept Stormwater Management Plan will provide adequate treatment of runoff from both construction and ongoing operations for the proposed Cooranbong LWC. Each of the mitigation measures outlined above will be incorporated into the CEMP for the site to ensure that the impact of the proposal on the environment is minimised.

6.8 Soil and water impact assessment and stormwater concept

Whitehead and Associates were engaged to prepare a Soil and Water Impact Assessment for the proposed development. The objective of the Assessment was to address the issue of soil and water quality as listed in the SEARs and described below:

"Soil and water quality – detail the potential occurrence of contaminated soils and likely impacts from the disturbance of those soils, including impacts on water quality. This must include an assessment of contamination resulting from the proposal. The assessment must detail what the potential for contamination will be and the water quality expected to be output by the facility."

To carry out the investigations effectively the Assessment reviewed the Preliminary Contamination Assessment as contained in **Appendix 7,** and the Stormwater Management Strategy as contained in **Appendix 8**. Additionally the Assessment drew upon information contained in the Land Capability Assessment and Staging Assessment reports prepared by Whitehead and Associates which provide a water

balance analysis and assessment of the use of recycled water on the JPG controlled land within the North Cooranbong Residential Precinct.

Findings and recommendations from the Soil and Water Impact Assessment are summarised below and the Assessment is contained in **Appendix 9.**

6.8.1 Potential impacts

The Assessment reviewed the potential soil and water impacts from potential existing contamination sources and states these are typical contaminants that could arise from the potential historical sources listed in the Preliminary Contamination Assessment.

In regards to chemicals, heavy metals and asbestos the Assessment states that in most cases, the contaminants were below the level of detection. Detected contaminants were at very low concentrations relative to the guideline thresholds of the National Environment Protection (Assessment of Site Contamination) Measure 2013.

Therefore, on the basis of information provided in the Preliminary Contamination Assessment the Soil and Water Impact Assessment considered that the risks of appreciable soil and water contamination by the contaminants arising from disturbance of soils within the footprint of the proposed development during construction and operation are considered to be very low to negligible.

The Assessment states that if during construction of the LWC, unidentified surface or subsurface contamination is encountered or expected, then an environmental consultant should be engaged to provide specific assessment and handling advice. The Assessment also notes that if during construction of the LWC, the disposal system of the “off site” house is located within the footprint of the site then the soils disturbed by construction may be impacted with pathogens and viruses. The soils would need to be assessed and treated in accordance with NSW EPA Use and Disposal of Biosolids Products, 2000. Based on historical evidence it is unlikely that this situation will arise.

The Assessment notes that the moderate to high erosion risk of soils across the site are a source of potential soil degradation and water contamination (with suspended and dissolved solids) during the construction phase. This will be addressed by adherence to the Concept Stormwater Management Strategy and the CEMP (or/and any future plans) to manage erosion and sediment control during construction).

The Assessment notes that erosive soils pose an ongoing risk to water quality and soil degradation during the operation phase, if they are exposed. All exposed soils should be appropriately covered (i.e. with vegetation, mulch, hardstand areas or LWC infrastructure) to minimise the erosion risk, as per the Concept Stormwater Management Strategy and the CEMP.

The Assessment concludes that the risks of appreciable soil and water impacts arising from acid sulphate soils is considered to be very low, for construction and operation of the proposed LWC.

Standard operation procedures and associated documentation will be developed prior to commissioning of the LWC in accordance with regulations under the NSW Water Industry Competition Act 2006 (“WICA”). The standard operating procedures will be developed to address the identified risks (including incidents and emergencies).

The Assessment notes that a range of chemical compounds will be used in the treatment process, including:

- Alum;
- Activated Carbon (in granular or powdered form);

- Citric Acid;
- Caustic soda; and
- Chlorine.

The compounds will be relatively small in volume and easily stored within appropriate containers secured within the LWC compound. The risks of soil and water contamination resulting from spillage from, or inappropriate storage or handling of these compounds on the site are considered to be very low.

Identified waste products from the operation of the LWC are:

- Dewatered Waste Activated Sludge (WAS), including membrane screenings, which will be disposed off-site in a licensed solid waste facility or via HWC's existing sewerage network via a trade waste agreement under a trade waste agreement with HWC; and
- Dewatered screenings collected and disposed off-site via an approved waste management contractor.

WAS and screenings are expected to be relatively small in volume and easily stored within appropriate containers secured within the LWC compound. The risks of soil and water contamination resulting from spillage from, or inappropriate storage or handling of, the WAS on the site is considered to be very low.

6.8.2 Conclusions

In general terms, the Assessment states that information reviewed suggests that the potential risks are manageable, provided that appropriate mitigation controls and adaptive management measures are in place for the construction of the LWC, which are documented elsewhere in Section 6 and 7 of this EIS, and for the entirety of its operational life.

6.9 Human health

As detailed in Section 6.1 of this EIS the operator of the proposed development has prepared a preliminary risk assessment including risks to human health. **Table 13** provides a summary of the risks and relation to human health the potential hazards, the controls that will be provided and the post mitigation (residual) risks. Provided the controls as documented in **Table 13** are in place, thus ensuring appropriate standards are met, it is then considered that the output of the proposed development will be acceptable as the residual risks will be low to moderate.

Table 13 Human health risks, controls and residual risks

Potential Hazard	Pre Mitigation Risk	Controls	Residual Risk
Product water out of specification due to process failure	Very High	▪ Production shut down ▪ Duty / standby of equipment ▪ Inlet and product water buffer storage ▪ Monitoring and controls ▪ Proactive maintenance regime ▪ Experienced operators	**Low**
Noise and Odour	High	▪ Odour and noise modelling at planning phase ▪ Odour scrubbing ▪ Noise mitigation in building design	**Moderate**

Potential Hazard	Pre Mitigation Risk	Controls	Residual Risk
Environmental spill from tank rupture	Very High	▪ Quality assurance processes in construction ▪ Isolation from stormwater drainage ▪ Experienced construction contractors and operators ▪ Monitoring of tank levels	**Moderate**

6.10 Air Quality

Pacific Environment was engaged to prepare an Odour Impact Assessment of the proposed development and for inclusion within this EIS. Findings and recommendations from the Assessment are summarized below and the Assessment is contained in **Appendix 10**.

6.10.1 Existing Environment

The Assessment provides a discussion of air quality issues with respect to odour and reviews the dispersion meteorology in the area. The Assessment then evaluates potential odour impacts for two operational scenarios.

To characterise the potential odour impacts of the proposed development, odour sampling was done at a similar WRF in Pitt Town, NSW. The purpose of the monitoring was to characterise the odour from the existing facility and use the data to derive odour emission rates (OERs) for use in odour impact assessments for the proposed facility.

The overall approach to the assessment follows the *Approved Methods and Guidance for the Modelling and Assessments of Air Pollutants in NSW (*NSW EPA Approved Methods) using the Level 2 assessment methodology. The NSW EPA Approved Methods specify how assessments based on the use of air dispersion models should be completed. They include guidelines for the preparation of meteorological data to be used in dispersion models and the relevant air quality criteria for assessing the significance of predicted concentration and deposition rates from the proposed development. The approach taken in this assessment follows as closely as possible the approaches suggested by the NSW EPA Approved Methods.

The air dispersion modelling conducted for this assessment is based on an advanced modelling system using the AERMET/AERMOD model. AERMOD was chosen as the most suitable model due to the source types, location of nearest receptors and nature of local topography.

6.10.2 Potential Impacts

The odour impact at the site was assessed for two scenarios as follows:

- Only interim FBT's are operational; and
- Fully operational plant and interim FBTs decommissioned.

The predicted odour concentrations for these scenarios, including corresponding contour plots, are provided in Section 7 of the Assessment. All odour concentrations are predicted to be below the EPA criterion of 2 OU (99th percentile) at all receptors investigated and as values modelled do not reach this level the 2 OU criteria contour is not plotted on the contour plots contained in the Assessment.

The Assessment notes that the predicted odour concentrations produced are at or below the 1 OU (99th percentile), the theoretical level at which odour becomes detectable but not necessarily distinguishable, at all receivers.

6.10.3 Proposed Mitigation Measures

Based upon the findings of the Assessment specific mitigation measures relating to odour at the operational phase of the proposed development have not been suggested by Pacific Environment Pty Ltd. However the following mitigation measures are recommended by RPS to minimise the impact of more general air quality issues.

- All vehicles and machinery will be fitted with approved exhaust systems to maintain exhaust emissions within accepted standards.
- Machinery and vehicles will not be left running or idling when not in use for long periods.
- Odour or air pollutant emission complaints will be dealt with promptly and the source will be eliminated wherever practicable.
- All loads of excavated material, soil, fill and other erodible matter that are transported to or from the work site will be kept covered at all times during transportation and will remain covered until they are unloaded either for use at the work site, reuse or disposal at a licensed waste disposal facility.
- All work sites, general work areas and stockpiles will be closely monitored for dust generation and watered down (with clean water) or covered (via seeding or tarpaulins) in the event of dry and/or windy conditions.
- Rehabilitation of disturbed surfaces would be undertaken within 20 days of completion of construction on site.

6.10.4 Conclusion

The Odour Impact Assessment Report assessed the air quality impacts of the Cooranbong LWC. The Assessment was based on odour emission rates derived from measurements at a similar WRF operating and combined with local meteorological data and computer-based dispersion modelling to determine air quality impacts on the existing and proposed residential areas in the vicinity of the WRF plant.

Results from the dispersion modelling using all measured data indicated that predicted odour concentrations at the boundary of the proposed facility would comply with the most stringent EPA assessment criterion of 2 OU (99th percentile) at all sensitive receivers. Further the predicted odour concentrations produced are at or below the 1 OU (99th percentile), the theoretical level at which odour becomes detectable but not necessarily distinguishable, at all receivers.

6.11 Noise and vibration

Wilkinson Murray Pty Ltd were engaged to prepare an Acoustic Assessment of the proposed development. The Assessment included the analysis of construction noise and vibration impacts as well as operational noise impacts. Findings and recommendations from the Assessment are summarized below and the Assessment is contained in **Appendix 11**.

6.11.1 Existing Environment

The existing area surrounding the proposal site is predominantly rural in nature. Residential areas are currently located approximately 150m to the west, 100m to the east and 180m south of the site.

The noise monitoring equipment used for the unattended measurements consisted of an ARL-215 Environmental Noise Logger set to A-Weighted, Fast response continuously monitoring over 15 minute sampling periods. This equipment is capable of remotely monitoring and storing noise level descriptors for later detailed analysis. The equipment calibration was checked before and after the survey and no significant drift occurred.

A plan showing the noise monitoring locations (Monitoring Location 1 and Monitoring Location 2) and the nearest existing (Location R1 and Location R3) and future residential areas (Location R2) used in the Assessment is found as **Figure 7.**

Both amenity and intrusiveness criteria were adopted by the Assessment. Background noise levels (Rating Background Levels – RBL) were measured and determined by the Assessment Report as detailed in **Table 14**.

Table 14 Measured rating background noise levels (dBA)

Location	Day (7am – 6pm)	Evening (6pm – 10 pm)	Night (10 pm – 7 am)
North western boundary of Lot 12 DP 1158508	37	36	32

6.11.2 Road Traffic Noise Criteria and Impacts

The Assessment notes that there are no criteria which relate to temporary changes in traffic noise during construction periods. However it is desirable that noise associated with truck deliveries to the site comply with the criteria shown in the *NSW Road Noise Policy* (RNP) published by EPA in March 2011. The main roads affected by heavy vehicle movements will be Freemans Drive which is a sub-arterial road and the gravel road during construction and initial years of operation. On this basis, the traffic noise criteria for the proposed development have been taken from the RNP and are shown in **Table 15**.

Table 15 Road noise criteria

Road Category	Type of Project / Land Use	Assessment Criteria dBA Day (7am – 10 pm)	Assessment Criteria dBA Night (10 pm – 7 am)
Local Roads	Existing residences affected by additional traffic on existing local roads generated by land use development	LAeq,1hr 55 (external)	LAeq,1hr 50 (external)
Sub-Arterial Roads	Existing residences affected by additional traffic on existing freeways/ arterial / sub-arterial roads generated by land use developments	LAeq,15hr 60 (external)	LAeq,9hr 55 (external)

A review of the road noise criteria in **Table 15** indicates that the applicable criteria are LAeq,1hr of 55dBA for local roads (Access Road 1) and LAeq,15hr of 60dBA for sub-arterial roads (Freemans Drive).

Road traffic noise has been calculated for heavy vehicle movements to the site and existing traffic movements have been ignored. The anticipated peak movement per day is eight concrete trucks per day at the peak of the construction. In addition, there will be an average of two truck movements per day for the delivery of other plant, materials and equipment. Based on this information the following noise levels have been calculated:

- Access Road 1 (new local road) – LAeq,1hr of 51dBA at the façade of the nearest noise sensitive

receiver (approximately 13m from the road). This is based on 1 movement per hour; and

- Freemans Drive (existing sub-arterial road) - LAeq,15hr of 49dBA at the façade of the nearest noise sensitive receiver (approximately 17m from the road). This is based on 5 movements per day.

The Assessment notes that the predicted road traffic noise levels above are well within the RNP criteria. Therefore, noise impacts would be minimal.

6.11.3 Construction Noise and Vibration Criteria and Impacts

Construction Noise Management Levels

For residences, the basic daytime construction noise goal is that the LAeq, 15min noise management level should not exceed the background noise by more than 10dBA. This is for standard working hours: Monday to Friday 7.00am-6.00pm, and Sunday 8.00am -1.00pm. Outside the standard hours, where construction is justified, the noise management level would be background plus 5dBA.

Typical background noise levels in the area surrounding the construction site have been measured and based on these levels, the following applicable noise management levels (NML's) for construction activities at surrounding residential receivers have been adopted:

- Monday-Friday (typical 7am-6pm) LAeq,15min 47 (37+10) dBA
- Saturday (typical 8am -1pm) LAeq,15min 44 (34+10) dBA
- Saturday (out of hours until 6pm) LAeq,15min 37 (32+5) dBA
- Highly noise affected LAeq,15min 75 dBA

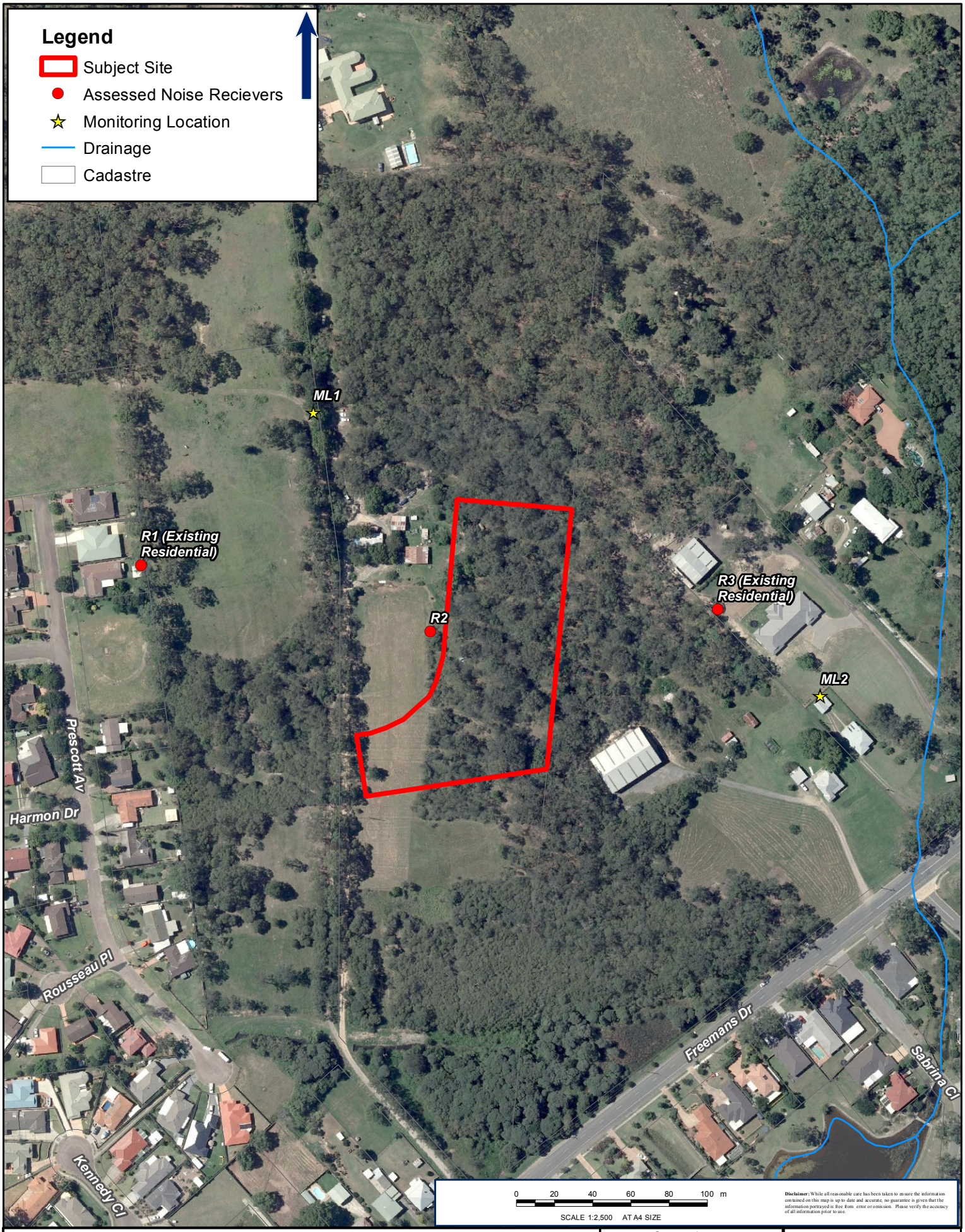


Figure 7: Noise Monitoring Location Plan

LOCATION: Cooranbong	DATUM: GDA94 PROJECTION: MGA Zone 56
JOB NO.: **PR122830** PURPOSE: PLANNING Technician: Natalie.Wood Date: 29/07/2014	Data Sources: Client Supplied RPS

CLIENT: Flow Systems Pty Ltd

RPS AUSTRALIA EAST PTY LTD (ABN 44 140 292 762)
241 DENISON STREET BROADMEADOW PO BOX 428 HAMILTON NSW 2303
T: 02 4940 4200 F: 02 4961 6794 www.rpsgroup.com.au

RPS

Path: J:\JOBS\122k\122830 Cooranbong - DA and EIS\10 - Drafting\Arcgis Map Documents\122830 Figure 6 Noise Monitoring A4.mxd

Vibration Criteria and impact

The Assessment notes that the distance from vibration intensive plant to the nearest residential receiver is considered to be large (approximately 70m) and therefore ground vibration at surrounding residential receivers would be low. On this basis, the recommended safe working distances for vibration intensive plant as suggested in the *Transport Construction Authority's Construction Noise Strategy* (2012) have been adopted in this assessment to evaluate the vibration impacts. **Table 16** sets out the recommended safe working distances for various vibration intensive plant.

Table 16 Recommended safe working distances for vibration intensive plant

Item	Description	Safe Working Distance Cosmetic Damage	Safe Working Distance Human Response
Small Hydraulic Hammer	(300kg – 5 to 12t excavator)	2m	7m
Medium Hydraulic Hammer	(900kg – 12 to 18t excavator)	7m	23m
Pile Boring	Less than 800mm	2m (nominal)	N/A
Jackhammer	Hand Held	1m (nominal)	Avoid contact with structure

A review of the information in **Table 16** indicates that the human comfort vibration impacts at surrounding residences would be minimal when using rock breakers. Furthermore, structural damage vibration criteria in residential buildings are much higher than human comfort criteria, and the nearest residential receiver is situated far enough for impacts to be minimal in all circumstances. The Assessment concludes that no further vibration consideration is required.

Predicted Construction Noise Levels

Sound Power Levels (SPLs) for typical construction plant likely to be used in the construction of the proposed development were considered. Calculation of likely construction noise at surrounding receivers has been undertaken for the proposed construction works. Site-related noise emissions were modelled with the "CadnaA" noise prediction software.

Some specific control measures were considered necessary for the site and these have been included in the prediction of construction noise levels. There are a number of stages of the work proposed and some stages will be noisier than others. **Table 17** shows the predicted noise levels at each of the noise catchment areas for the noise significant stages of the work during normal construction hours.

Table 17 Predicted construction noise levels at residence – $L_{aeq,15min}$ (dBA)

Noise Catchment Area	Predicted Noise Level	Weekday NML	Exceedance	Sunday NML*	Exceedance
Scenario – Site Clearing and Grubbing					
A	65	47	18	47 (42)	18 (23)
B	64	47	17	47 (42)	17 (22)
C	61	47	14	47 (42)	14 (19)
Scenario – Bulk Earthworks					
A	63	47	16	47 (42)	16 (21)
B	62	47	15	47 (42)	15 (20)
C	59	47	12	47 (42)	12 (17)

Noise Catchment Area	Predicted Noise Level	Weekday NML	Exceedance	Sunday NML*	Exceedance
Scenario – Foundation Construction					
A	57	47	10	47 (42)	10 (15)
B	56	47	9	47 (42)	9 (14)
C	53	47	6	47 (42)	6 (11)
Scenario – Superstructure Construction					
A	58	47	11	47 (42)	11 (16)
B	57	47	10	47 (42)	10 (15)
C	54	47	7	47 (42)	7 (12)
Scenario – General Construction					
A	55	47	8	47 (42)	8 (13)
B	54	47	7	47 (42)	8 (13)
C	51	47	4	47 (42)	4 (9)

A review of results in **Table 17** indicates the following:

- Exceedances of up to 18 dBA at residences to the west of the site are expected during site clearing and bulk earthworks period due to the operation of a wood chipper and a combination of mobile plant items such as excavator and trucks. This magnitude of exceedance is consistent with similar sites where residences overlook development sites.
- During the structure stage the magnitude of exceedance will decrease due to the nature of construction activities. Fit-out works are less noise intensive and this would result in general compliance at residences during this stage (not shown in **Table 17**).
- Greater exceedances are predicted on Sundays due to more stringent noise management levels that are triggered by the proposed extended hours of operation on this day. It is noted that all predicted noise levels are below the “highly noise affected” noise objective.

Based on these findings, the Assessment states that adoption of reasonable and feasible noise management and mitigation will be required. These measures are detailed in Section 6.10.5.

6.11.4 Operational Noise Impacts

Table 18 below presents a summary of the noise criteria for the existing residential receivers surrounding the site using the background noise levels, refer to **Table 18**, established by the Assessment.

Table 18 Project specific criteria (dBA)

Time Period[1]	Intrusiveness Criterion $L_{Aeq,15min}$	Amenity Criterion $L_{Aeq,period}$
Daytime	**42**	55
Evening	**41**	45
Night time	**37**	40

Note: 1) Daytime 7.00am–6.00am; Evening 6.00pm–10.00pm; Night 10.00pm-7.00am
2) Noise criteria applicable to this assessment are highlighted in bold

The Assessment notes that the operational noise will be constant and not varying in level and hence the lower criterion for each period will apply as highlighted in **Table 18**. For assessing the back-up generator, a positive adjustment of 5dB will apply to the daytime acceptable level of 42 dBA.

Operational noise levels were calculated using the Cadna A 4.6 computer modelling program based on ISO 9613 algorithms. Using Cadna A it is possible to build a model of the facility noise sources and the surrounding area. The model is capable of taking account of the following parameters:

- Noise source levels;
- Topography between the facility and the residences;
- Any shielding by buildings between noise sources and receivers; and
- Meteorological effects which could change noise propagation.

Noise source levels used in the Assessment are summarised in **Table 19**.

Table 19 Operational noise source levels

Description	Qty	Sound Pressure Level at 1m
Backup Generator	**1 x duty**	81dBA each
Membrane tank drain pump	**1 x duty**	75dBA each
WAS pump	**1 x duty**	72dBA each
Permeate pump	**1 x duty / 1 x standby**	75dBA each
Membrane blower	**1 x duty / 1 x standby**	75dBA each
Process blower	**2 x duty / 1 standby**	75dBA each
Compressor	**1 x duty / 1 x standby**	65dBA each
WAS Dewatering	**1 x duty**	72dBA each
Drinking water distribution pumps	**2 x duty / 1 x standby**	75dBA each
Recycled water distribution pumps	**2 x duty / 1 standby**	75dBA each
6hp Air-Con Unit (Wilkinson Murray database)	**1 x duty**	64dBA each

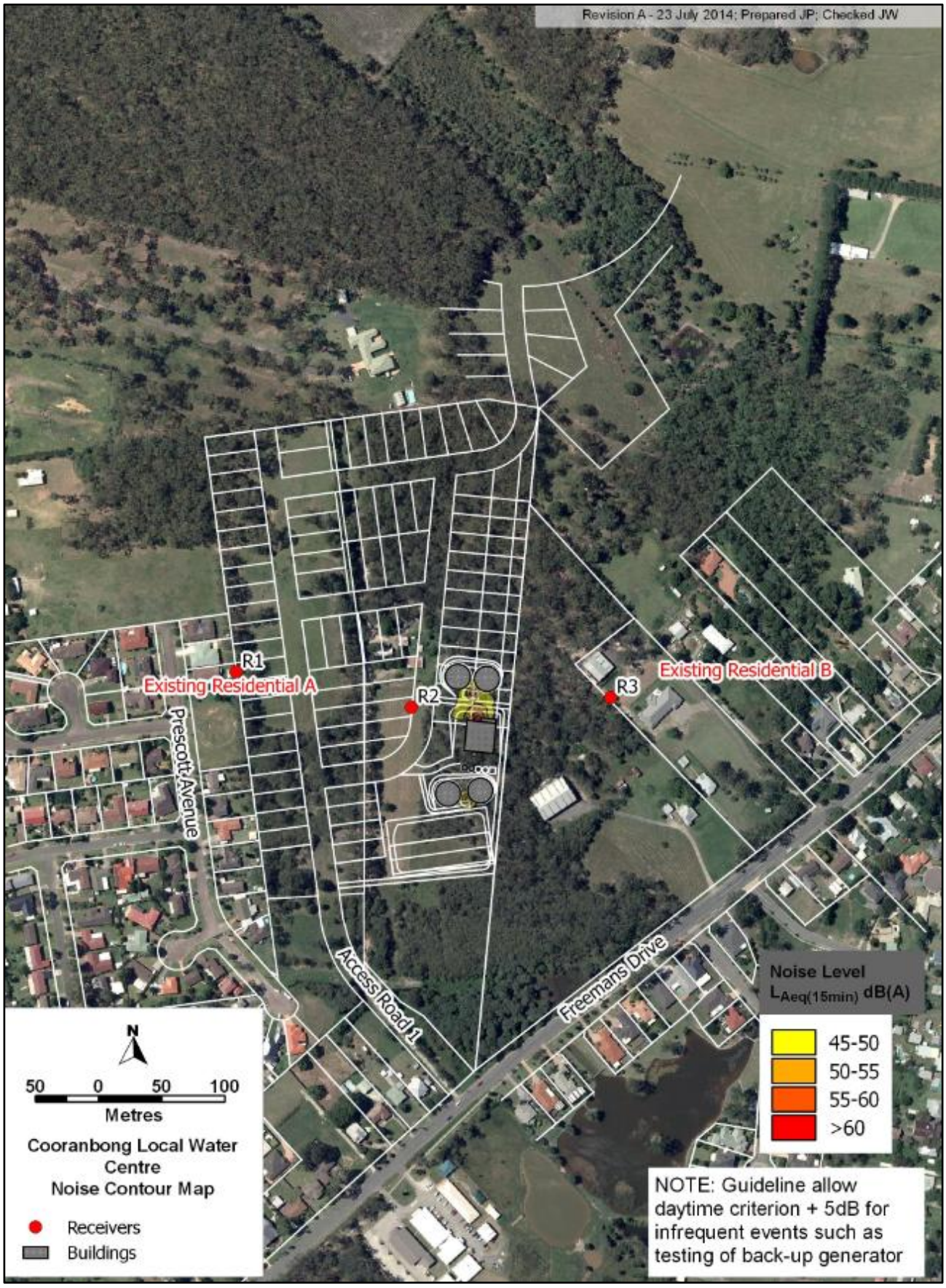
The results of the modelling of the typical operation of the proposed development with recommended mitigation measures in place are presented in graphical form as a contour map in **Figure 8**. The results of the modelling of the proposed development under abnormal operating conditions involving the use of a back-up generator but with recommended mitigation measures in place are presented in graphical form as a contour map in **Figure 9.**

When all plant, excluding back-up generator, are operating, the predicted noise levels comply with the limiting 37dBA night time noise criterion at the nearest existing residential receivers and new residential receivers. The Assessment concludes that no further acoustic consideration is required.

A review of the predicted noise levels from all noise sources with the back-up generator in operation (noting that the back-up generator does not usually operate and will be tested in operation during daytime hours either oncer per month for 30 min or once every 2 months for 1hour) indicates compliance with the adjusted daytime acceptable noise level of 47dBA at the nearest existing residential receivers and new residential receivers. The Assessment concludes that no further acoustic consideration is required.

Figure 8 Noise modelling – normal operation without back-up generator and with recommended mitigation measures

Figure 9 Noise modelling – normal operation with back-up generator and with recommended mitigation measures



6.11.5 Proposed Mitigation Measures

Without mitigation, noise levels from construction activities have been predicted to exceed the noise management levels nominated in the guidelines at some surrounding receivers. Therefore, noise control measures are recommended to ensure that noise is reduced where feasible.

The following proposed development specific mitigation measures are recommended:

- Selection of quietest feasible construction equipment;
- Localised treatment such as barriers, shrouds and the like around fixed plant such as pumps, generators and concrete pumps; and
- Provision of respite periods, particularly on Sundays; (louder items to operate after 8 am).

In addition, the following measures should be included in a Noise and Vibration Management Plan to be prepared prior to issue of a construction certificate (CC):

- Plant Noise Audit – Noise emission levels of all critical items of mobile plant and equipment should be checked for compliance with noise limits appropriate to those items prior to the equipment going into regular service. To this end, testing should be established with the contractor;
- Environmental Inductions – It is important that an induction is provided to all site personnel with an emphasis on understanding and managing noise impacts;
- Equipment Selection – All fixed plant at the work sites should be appropriately selected, and where necessary, fitted with silencers, acoustical enclosures and other noise attenuation measures in order to ensure that the total noise emission from each work site complies with EPA guidelines; and
- Site Noise Planning – Where practical, the layout and positioning of noise-producing plant and activities on each work site should be optimised to minimise noise emission levels.

The adoptions of the above measures are aimed at working towards achieving the noise management levels established at surrounding receivers.

6.11.6 Community Liaison and General Approaches to Mitigation

The Assessment identifies that an effective community relations programme should be put in place to keep the community that has been identified as being potentially affected appraised of progress of the works, and to forewarn potentially affected groups (e.g. by letterbox drop, meetings with surrounding owners/tenants, etc.) of any anticipated changes in noise and vibration emissions prior to critical stages of the works, and to explain complaint procedures and response mechanisms.

Close liaison should be maintained between the communities overlooking work sites and the parties associated with the construction works to provide effective feedback in regard to perceived emissions. In this manner, equipment selections and work activities can be coordinated where necessary to minimise disturbance to neighbouring communities, and to ensure prompt response to complaints, should they occur.

6.11.7 Noise and Vibration Management Plan

The Assessment also recommends that a Construction Noise and Vibration Management Plan be prepared prior to issue of a CC. Matters that should be addressed in plan include:

- noise and vibration monitoring;
- response to complaints;
- responsibilities;

- monitoring of noise emissions from plant items;
- reporting and record keeping;
- non-compliance and corrective action; and
- Community consultation and complaint handling.

The plan should be developed by the successful contractor and be part of their Site Construction Environmental Management Plan.

6.11.8 Conclusion

Vibration associated with on-site construction activities has low potential to impact on receivers surrounding the site. Furthermore, road traffic noise associated with heavy vehicle movements (such as delivery of equipment, materials and concrete, etc.) on adjacent roads also has minimal impact on receivers surrounding the site. Accordingly, management of noise from construction activities is recommended to be included in the Site Construction Environmental Management Plan prepared by the successful contractor.

Predicted operational noise levels from the proposed development indicate compliance with all noise criteria on all occasions at the closest identified noise sensitive locations (both existing and future). Predicted noise level from the back-up generator, which will only operate in abnormal circumstances, also indicate compliance with the adjusted intrusive daytime noise level at the closest identified noise sensitive locations (both existing and future).

6.12 Traffic

6.12.1 Existing Environment

The site is located immediately east of the southern area of the North Cooranbong Residential Precinct and permanent access to the site will be via an unnamed road that will link the North Cooranbong Residential Precinct with Freemans Drive. Initially connection to the facility will be made via a temporary gravel road connecting the existing driveway access off Freemans Drive in Lot 212, DP 1037011.

It is noted that in the future JPG are required to upgrade and install traffic signals at the Freemans Drive intersection to the south of the site. These works will be pursuant to the executed North Cooranbong planning agreement. The intersection will have available capacity to cater for the small number of service and delivery vehicles that need to access the proposed development site.

The proposed development will have suitable access and parking arrangements for service and delivery vehicles attending to site. Appropriately positioned external lighting will be provided to the external areas of the facility building which is configured with movement sensors and light sensors to provide additional deterrent against vandalism and graffiti. CCTV monitoring of external areas will be provided for security.

6.12.2 Potential Impacts

Vehicle movements during construction will mostly consist of the floating of earthmoving equipment and concrete agitator trucks delivering concrete during scheduled pours. Concrete truck movements will occur at various stages throughout the construction period and will peak at around eight concrete trucks per day at the peak of the construction. In addition, there will be an average of two truck movements per day for the delivery of other plant, materials and equipment.

Once the facility is fully operational, truck movements will be limited to chemical deliveries and is estimated at one to three trucks per month. Operator(s) will visit the site 2-3 times per week in standard utilities or passenger vehicles. Solid waste disposal will be managed through the connection to HWC's sewerage network and agreement with HWC. If this agreement is not reached with HWC, up to an additional 3 trucks per week will be required to collect the solid waste bins.

6.12.3 Proposed Mitigation Measures

It is to be noted that JPG will be constructing the unnamed road linking North Cooranbong Residential Precinct with Freemans Drive.

The contractors constructing the Cooranbong LWC will employ all measures to ensure that the proposal does not significantly reduce road capacity or disturb traffic flows. Appropriate exclusion barriers, signage and site supervision will be employed at all times to ensure that the work site is controlled and that unauthorised vehicles and pedestrians are excluded from the works area. The following mitigation measures will be applied throughout the duration of the works:

- The Contractor will maintain a complaints register. Any complaints received will be responded to as soon as possible.

A traffic control plan prepared by a suitably qualified person will be submitted to Cooranbong Water as part of the successful contractor's Site Construction Environmental Management Plan for approval prior to commencement of work on the site.

6.13 Visual Amenity

6.13.1 Existing Environment

The proposed development will be located on land currently zoned 10 Investigation (Urban Conservation) but proposed to be subdivided under a future residential zone. The Cooranbong LWC site is situated on a gently sloping lower slope landform. The western portion of the site is covered with grass while the eastern portion is covered in tree vegetation. Tree vegetation exists on the property immediately to the east of the site and the proposed development will not be visible to the existing residence on this land parcel. Likewise large areas of tree vegetation obscure the proposed development from existing residences on land parcels to the west.

6.13.2 Potential Impacts

Visual impacts will be short ones. Potential short term construction impacts include the presence of mobile plant machinery, warning / flashing lights, barriers, signage and construction machinery, minor stripping of soil and the occurrence of temporary stockpiles during excavation and filling and presence of temporary environmental management devices such as silt fences and perimeter fencing. As discussed earlier in this EIS the proposed development will include the removal of a limited number of trees.

The design of the Cooranbong LWC although housing an industrial type of activity is nevertheless detailed in a manner that is sympathetic to its location on the margin of a future residential area. Architectural finishes and treatments range from concrete, glass and expressed steel columns/beams to colour bond steel for roofs and outbuildings, to provide a robust look to the facility but with architectural detail to integrate the facility into a residential neighbourhood. The facility is intended to present as a community asset. Architectural drawings illustrating these features are contained in **Appendix 2**.

The proposed development will include a number of soft landscaping features to provide an effective screening of the development from future residential development. Additionally, it is unlikely that there will be any visual impact on the existing residence on land to the east due the existence of tree vegetation on that land. Furthermore it is unlikely that there will be any visual impact on existing residences to the west again due to the existence of tree vegetation and ultimately future residential development between them and the proposed development.

6.13.3 Proposed Mitigation Measures

The following mitigation measures will be applied throughout the duration of the works:

- On completion of the works, all vehicles, construction equipment, materials, and refuse relating to the works will be removed from the work site(s) and any adjacent affected areas.

6.14 Waste generation and hazards

6.14.1 Potential Impacts

During construction of the Cooranbong LWC, soil will be stockpiled to one side and back filled. The soil stockpile will be protected from dispersion by runoff during storm events through the implementation of best practice Erosion and Sediment Control measures.

Any excess spoil will be utilised within the Cooranbong LWC site or the North Cooranbong Residential Precinct site. Construction waste (concrete, off cuts and general waste etc) will be stored and disposed of in accordance with waste disposal safeguards.

Waste materials likely to be generated by the proposed development include:

- Green waste from clearing vegetation;
- Off-cuts of piping from construction works;
- Timber and other material off-cuts from construction of the LWC; and
- Domestic waste such as paper, aluminium cans and material generated by workers.

There will be two operational waste streams generated by the LWC, namely:

- Dewatered screenings – collected and disposed off-site by an approved waste management contractor; and
- Waste activated sludge (WAS) – agreement will be sought with HWC to take this in its existing sewerage system. If this cannot be achieved, it will be collected and disposed offsite via an approved waste management contractor.

6.14.2 Proposed Mitigation Measures

Waste generated would be managed in accordance with the CEMP for the works. The following mitigation measures will be applied throughout the duration of the works:

- All waste generated during the course of the works will be reused or removed from the work areas as soon as practicable and disposed of in accordance with the waste disposal safeguards.
- All vessels used for contaminated or hazardous waste should be sealed, labelled according to their contents, and stored within bunded areas until their removal from the work site.
- Any fuel, lubricant or hydraulic fluid spillages will be collected using absorbent material and the

contaminated material disposed of at an OEH licensed waste depot.

- The work site will be left clean and free of weeds, debris and other rubbish at the end of works.
- All hazardous wastes on site will be removed and disposed in accordance with the state and national regulations and guidelines and best practice for the removal of these materials.
- The Contractor's recycling and reuse proposal will be detailed in the CEMP.
- Green waste from vegetation clearing will be either chipped for reuse; retained for rehabilitation; or mulched and spread immediately after the trench has been covered to prevent encroachment by weed species and minimise erosion. NB: where mulched vegetation is to be used measures to prevent organic material entering the local waterway shall be installed.
- Off-cuts of piping and other materials used in the construction of the Cooranbong LWC will be recycled where possible.

6.14.3 Conclusion

The extent of the potential waste impacts is low due to the relatively small amounts of waste to be generated and the short time-frame for construction. There will be no onsite maintenance of vehicles and machinery. Refuelling of vehicles and machinery would be undertaken at designated refuelling stations off site.

In conclusion, the potential waste impact from the construction of the proposed development will be low as the mitigation measures detailed above would be employed at all stages of construction works.

6.15 Bushfire

RPS was engaged to prepare a Bushfire Threat Assessment for inclusion within this EIS. Findings and recommendations from the Assessment are summarized below and the Bushfire Threat Assessment is contained in **Appendix 12.**

6.15.1 Existing Environment

The site is within an area that is classified as Bushfire Prone Land, and the surrounding vegetation may represent a potential threat to the proposed development. The Assessment considers the bushfire hazard and associated potential threats relevant to the proposed development. It outlines the minimum mitigative measures that would be required in accordance with PBP 2006, which has been adopted by the *Environmental Planning & Assessment Amendment* (Planning for Bush Fire Protection) *Regulation 2007* & the *Rural Fires Amendment Regulation 2007.* Additionally the Assessment addresses the requirements of Section 79BA of the *Environmental Planning & Assessment Act 1979*.

Buildings as contained in the proposed development are classified as Class 5 – 8 within the BCA. Therefore, the provisions of PBP 2006 do not strictly apply. As mentioned above the site is however within an area that is classified as Bushfire Prone Land, and the surrounding vegetation may represent a potential threat to the proposed development. On this basis the Assessment is based on industrial development. Accordingly the aims and objectives of PBP 2006 and setback measures were considered in the preparation of the Assessment.

6.15.2 Potential Impacts

The Assessment found the land surrounding the site to support vegetation consistent with forest and forested wetland vegetation formation as described by PBP 2006. The Assessment reviewed the site conditions and the proposed development layout of the North Cooranbong Residential Precinct and

concluded that compliance with PBP 2006 can be achieved or practically implemented without substantial change to the proposed layout or construction methodology.

6.15.3 Proposed Mitigation Measures

Based upon the findings of the Assessment specific mitigation measures have been developed to enable the proposed development to comply with the PBP 2006 and are as follows:

- Bushfire buffers in the form of a Managed Fuel Zone are recommended to the north, south and west of the site between the hazard/s and proposed development;
- All new buildings and structures are to be constructed in accordance with AS3959 – 2009 – Bushfire Attack Level- 29 (BAL-29);
- Internal road networks should be designed and constructed in accordance with Section 4.1.3 – Property Access of PBP 2006;
- Any proposed development is to be linked to the existing reticulated water supply and that suitable hydrants be clearly marked in accordance with AS2419.1, 2005. Alternative water supplies may be considered where the proponent accepts that an adequate supply of water for firefighting operations can be provided; and
- An Emergency Management Plan is to be prepared to identify the nearest bushfire hazards and preferred refuges and evacuation routes.

6.15.4 Conclusion

The implementation of the mitigation measures provided above will enable the proposed development to comply with PBP 2006 and will contribute to the amelioration of the potential impact of any bushfire upon the development, but they do not and cannot guarantee that the area will not be affected by bushfire at some time.

6.16 Social and Economic

6.16.1 Existing Environment

The proposed development is located within the Lake Macquarie LGA. Nearest residences are located 150 metres to west and 100 metres to the east of the site. The North Cooranbong Residential Precinct is located to the north and west of the site and the Precinct is identified in the Lower Hunter Regional Strategy 2006 as a major release area. The Precinct is zoned for urban development under LM LEP 2004 and has Concept Approval (MP 07-0147) for up to 2,500 dwellings. Additionally two Voluntary Planning Agreements have been executed to secure environmental conservation lands and monetary contributions to offset ecological impacts.

6.16.2 Site alternatives and justification

The proposed development will allow for the management of sewage from the entire North Cooranbong urban release area. It will make a significant contribution to sustainability through the provision of refined water back to the residential area for toilet flushing, washing machines and irrigation and therefore satisfies the requirements of BASIX for potential home owners. The proposed development will provide an alternative to the traditional sewage treatment plant usually required to service new residential developments.

Section 1.5 of the EIS investigated alternatives to the proposed development. One alternative is to build a traditional local sewage treatment plant or WWTP with potential discharge to the local waterway, or to pipe the sewage to an existing sewage treatment plant for treatment and disposal, which would also require an

amplification/upgrade of the existing receiving treatment plant. Either alternative would be more expensive, take longer to implement, have greater potential environmental impacts, and fail to achieve sustainability initiatives for water re-use.

6.16.3 Limitations of the proposed development on servicing other developments

The Cooranbong LWC option, as detailed within this EIS, delivered, operated and maintained by Cooranbong Water, was adopted by JPG as the preferred option due to limited off-site impacts, economic viability, sustainability benefits and scalable platform allowing sewerage servicing to increase in line with the anticipated residential development and the volume of sewage to be treated.

The Cooranbong LWC will service the JPG controlled lands within the North Cooranbong Residential Precinct and has support from HWC, as identified in Section 5 of the EIS. Owners of other lands within Cooranbong will need to consult with HWC as to servicing of their lands and the ability of the proposed development to service the other lands is not subject of current investigation.

6.16.4 Potential Impacts

Construction of the Cooranbong LWC is likely to take approximately twelve months. There will be minor short term constructional impacts on existing local residents including the presence of machinery and associated traffic movements, and the minor visual impacts of these.

These impacts will be for a short period of time and will not create any long term socio-economic issues. There will be no impacts regarding the socio-economic setting of the community once the Cooranbong LWC is in operation.

Once in operation, Cooranbong Water will engage local contractors to assist with the maintenance of the pressure sewer scheme and Cooranbong LWC.

6.16.5 Conclusion

Provided that the mitigation measures documented in this EIS are implemented there will be no significant socio-economic impacts other than the positive impact of enabling an identified growth area to be adequately serviced by the necessary sewer infrastructure.

7.0 Mitigation Measures

The collective measures required to mitigate the impacts associated with the proposed development are detailed in **Table 20** below. These measures have been derived from the previous assessment in Section 6 and those detailed in the appended consultants' reports. Common mitigation measures between key environmental issues have been amalgamated.

Table 20 Impact and mitigation measures

Impact	Mitigation Measures
General	All contractors and machine operators will be inducted on the environmental sensitivities of the work site(s) and relevant safeguards.
Impacts to flora (loss of species and habitat) Direct Impact	The full extent of any vegetation clearance will be clearly documented and mapped in the site's CEMP. The CEMP will prepared by the construction contractor prior to the commencement of construction.
	Materials, plant and equipment will not be stored within the drip-lines of any trees to be retained within the site.
	To prevent damage to vegetation outside the boundaries of access tracks, vehicles and machinery will be restricted to designated work areas.
	Where access tracks run alongside areas of natural bushland, protective fencing or paraweb (or similar type) fencing is to be installed along the boundaries of the track to prevent vehicles from inadvertently entering/damaging bushland.
	Degradation or disturbance to areas of water front (riparian) vegetation will be avoided to the greatest possible extent. Any such areas will be clearly identified in the CEMP.
	Where excavated soil is to be used in site restoration, it will be excavated and stockpiled in sequential layers corresponding to the existing soil profile. Topsoil and leaf litter is to be removed first and windrowed in separate stockpiles of less than 1m in height on the upslope side of excavations. Soil layers will be replaced sequentially so that the soil profile is restored as closely as possible to its pre-work status.
Impacts to fauna (loss of species and habitat) (Direct impact)	Where possible, clearing activities will be timed to avoid removal of hollow-bearing trees during breeding season of threatened species.
	Placement of hollow logs and felled hollow-bearing trees within adjacent vegetation to provide additional habitat resources for terrestrial fauna.
	The clearing extents are to be clearly demarcated with temporary fencing before commencement of works.
Erosion and Sedimentation (Indirect impact)	Sediment and nutrient controls will be implemented to reduce the impacts of stormwater, erosion and sedimentation on water quality. Specific erosion and sediment controls are to be contained within the site Construction Environment Management Plan (CEMP).
	Installation of erosion and runoff control measures around cleared and operational areas.
	Clearing of vegetation is not to be undertaken during extensive or heavy rain events.
	Where excavated soil is to be used in site restoration, it will be excavated and stockpiled in sequential layers corresponding to the existing soil profile. Topsoil and leaf litter is to be removed first and windrowed in separate stockpiles. Soil layers will be replaced sequentially so that the soil profile is restored as closely as possible to its pre-work status.
	Sediment filters such as silt fences, coir logs, or turf strips will be located downstream of disturbed areas.
Weed Incursion (Indirect impact)	The work site will be left clean from debris and other rubbish and in a manner that does not promote the growth of weeds at the end of works.
	Machines, tools and contractors to follow wash down protocols in the CEMP to limit the spread and establishment of weeds on site.

Impact	Mitigation Measures
Heritage (Aboriginal and non-Aboriginal)	All temporary erosion and sediment control devices such as silt-stop fencing will be removed from the site at the completion of the works or when the site is stabilised.
	The Cultural Heritage Due Diligence Assessment Report (**Appendix 5** of the EIS) must be kept by the proponent or Cooranbong Water so that it can be presented, if needed, as a defence from prosecution under Section 86(2) of the *National Parks and Wildlife Act 1974*.
	If unrecorded Aboriginal object/s are identified on the site during works, then all works in the immediate area must cease and the area should be cordoned off. OEH must be notified by ringing the Enviroline 131 555, so that the site can be adequately assessed and managed.
	In the unlikely event that skeletal remains are identified, work must cease immediately in the vicinity of the remains and the area must be cordoned off. The proponent must contact the local NSW Police who will make an initial assessment as to whether the remains are part of a crime scene or possible Aboriginal remains. If the remains are thought to be Aboriginal, OEH must be contacted by ringing the Enviroline 131 555. An OEH officer will determine if the remains are Aboriginal or not; and a management plan must be developed in consultation with the relevant Aboriginal stakeholders before works recommence.
	If, during the course of development works, suspected historic cultural heritage material is uncovered, work should cease in that area immediately. The OEH (Enviroline 131 555) should be notified, and works are only to recommence when an approved management strategy has been developed.
Stormwater and water quality, erosion and sediment control	Sediment and nutrient controls will be implemented to reduce the impacts of stormwater, erosion and sedimentation on water quality. Specific erosion and sediment controls are to be contained within the site CEMP.
	All erosion and sediment control measures will be established before excavation and vegetation clearance begins. Control measures are to remain in place until all surfaces have been fully restored and stabilised.
	Sediment and erosion control devices will be inspected regularly, maintained to ensure effectiveness over the entire duration of the proposed development, and cleaned out before 30% capacity is reached.
	Mulch bunds up slope of the proposed disturbance areas.
	Coir logs at 15m centres within the proposed road side swales.
	Sediment fences down slope of all disturbed areas and material stockpile areas.
	Disturbed areas will be stabilised by revegetation within 10 days after completion of construction.
	Site disturbance will be minimised by containing machinery access to site areas required for approved construction works.
	Erosion potential would be limited by managing runoff fetches and velocities, with measures such as contour drains, silt fences and level spreaders
	Sediment filters such as silt fences, coir logs, or turf strips will be located downstream of disturbed areas.
	The storage and handling of fuels and chemicals shall comply with Australian Standard AS1940.
	No chemicals, fuels, and/or waste will be stored or collected for disposal within or adjacent to drainage lines or unsealed surfaces.
	A 'spill kit' will be kept on site at all times for potential chemical or fuel spills.
	Refuelling, fuel decanting and vehicle maintenance work will take place in a designated sealed and bunded area.
	An Incident Management Plan (IMP) will be prepared as part of the CEMP and will include a contingency plan and emergency procedures for dealing with the potential spillage of fuel or other environmental incidents that may occur on the work site. The IMP should also contain procedures dealing with the unexpected onset of rainfall during the work period.
	Drainage systems will be checked at regular intervals and maintained to ensure they are operating at full capacity (eg clearance of debris from drainage lines).

Impact	Mitigation Measures
Odour and Air Quality	All vehicles and machinery will be fitted with approved exhaust systems to maintain exhaust emissions within accepted standards.
	Machinery and vehicles will not be left running or idling when not in use for long periods.
	Odour or air pollutant emission complaints will be dealt with promptly and the source will be eliminated wherever practicable
	All loads of excavated material, soil, fill and other erodible matter that are transported to or from the work site will be kept covered at all times during transportation and will remain covered until they are unloaded either for use at the work site, reuse or disposal at a OEH licensed waste disposal facility.
	All work sites, general work areas and stockpiles will be closely monitored for dust generation and watered down (with clean water) or covered (via seeding or tarpaulins) in the event of dry and/or windy conditions.
	Rehabilitation of disturbed surfaces would be undertaken within 10 days of completion of construction on site.
Noise	All equipment used will comply with AS2436-1981 Guide to Noise Control on Construction, Maintenance and Demolition Sites.
	Work and deliveries will only occur during the following times: Monday to Friday 7am to 6pm. Work can occur on Sundays during the times 8am to 1pm. No construction work or deliveries will occur on Saturdays or public holidays.
	Regular and effective maintenance of all equipment, including vehicles moving on and off the site, will be conducted.
	Plant and equipment which is used intermittently will either be shut down in the intervening periods between works or throttled down to a minimum.
	Any portable equipment with the potential to create high levels of noise (e.g. compressors, generators) will only be selected for use if it incorporates effective noise control. This equipment should be located, where practical, so that natural ground barriers are between it and the nearest potentially affected receivers.
Traffic and access	The Contractor will maintain a complaints register. Any complaints received will be responded to as soon as possible.
	A traffic control plan prepared by a suitably qualified person will be submitted to the proponent or Cooranbong Water for approval prior to commencement of work on the site.
Visual character	On completion of the works, all vehicles, construction equipment, materials, and refuse relating to the works will be removed from the work site(s) and any adjacent affected areas.
Waste generation	All waste generated during the course of the works will be reused or removed from the work areas as soon as practicable and disposed of in accordance with the waste disposal safeguards.
	All vessels used for contaminated or hazardous waste should be sealed, labelled according to their contents, and stored within bunded areas until their removal from the work site.
	Any fuel, lubricant or hydraulic fluid spillages will be collected using absorbent material and the contaminated material disposed of at an OEH licensed waste depot.
	The work site will be left clean and free of weeds, debris and other rubbish at the end of works.
	All hazardous wastes on site will be removed and disposed in accordance with the state and national regulations and guidelines and best practice for the removal of these materials.
	The Contractor's recycling and reuse proposal will be detailed in the CEMP.
	Excess spoil material that cannot be reused on site will be utilised in the ongoing earthworks as part of the adjacent subdivision works.
	Green waste from vegetation clearing will be either chipped for reuse; retained for rehabilitation; or mulched and spread immediately after the trench has been covered to prevent encroachment by weed species and minimise erosion. NB: where mulched vegetation is to be used measures to prevent organic material entering the local waterway shall be installed.
	Off-cuts of piping and other construction material will be recycled where possible.

Impact	Mitigation Measures
Bushfire	Bushfire buffers in the form of a Managed Fuel Zone are recommended to the north, south and west of the site between the hazard/s and proposed development.
	All new buildings and structures are to be constructed in accordance with AS3959 – 2009 – Bushfire Attack Level- 29 (BAL-29).
	Internal road networks should be designed and constructed in accordance with Section 4.1.3 Property Access of PBP 2006.
	Any proposed development is to be linked to the existing reticulated water supply and that suitable hydrants be clearly marked in accordance with AS2419.1, 2005. Alternative water supplies may be considered where the proponent accepts that an adequate supply of water for fire fighting operations can be provided.
	An Emergency Management Plan is to be prepared to identify the nearest bushfire hazards and preferred refuges and evacuation routes.
Amenity and public information	The Contractor will maintain a complaints register. Any complaints received will be responded to as soon as possible.
	Accurate public information signs will be displayed while work is in progress and maintained in presentable manner.

8.0 Justification of the Proposed Development

8.1 Social and Economic

One of the NSW Government's priorities is to ensure that adequate land is available and appropriately located to sustainably accommodate the projected housing and employment needs of the Hunter Region's population over the next 25 years. The Lower Hunter Regional Strategy 2006 plans for the provision of sufficient new urban and employment lands to meet expected strong demands for growth.

The proposed development represents the development of a suitable site to enable the establishment of necessary infrastructure for a large residential area. The proposed development will provide an alternative to the traditional sewage treatment plant usually required to service new residential developments. The facility will also make a significant contribution to sustainability through the provision of recycled water back to the new residential areas.

Overall the proposed development will positively stimulate jobs and business investment, predominately through the construction of new homes and associated facilities, and in doing so deliver a number of social and economic benefits to Cooranbong and wider Lower Hunter Region.

8.2 Biophysical

The likelihood of potential impacts on species listed under the TSC Act and EPBC Act has been considered with regard to the proposed clearing of native vegetation and associated indirect impacts. As a result of all vegetation within the site potentially being removed, a small amount of habitat for threatened flora and fauna will be lost. However, due to the wider availability of commensurate habitats within the Olney State Forest and Environmental Corridor Areas associated with the North Cooranbong Residential Precinct, and recommended mitigation measures being employed to ameliorate other direct and indirect impacts, assessments under the TSC Act and regarding MNES concluded that the proposed development is unlikely to have a significant impact on threatened species, populations or EECs.

The proposed development is therefore considered unlikely to have a significant impact on the natural biophysical elements of the site and surrounding locality in the long term.

8.3 Ecologically Sustainable Development (ESD)

Ecologically Sustainable Development (ESD) is a primary objective of environmental protection in NSW. ESD is an objective of the EP&A Act under Section 5(a)(vii) and is defined under Section 4 of the EP&A Act : and is a required assessment consideration under Schedule 2, Part 3, clause 7 of the Environmental Planning and Assessment Regulation 2000. This clause requires an environmental impact statement to include the reasons justifying the carrying out of the proposed development in the manner proposed, having regard to biophysical, economic and social considerations, including the principles of ecologically sustainable development set out in subclause (4): Subclause (4) defines ecologically sustainable development as:

(a) *the precautionary principle—namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:*

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

(e) *(ii) an assessment of the risk-weighted consequences of various options,*

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

(c) *conservation of biological diversity and ecological integrity – namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration,*

(d) *improved valuation, pricing and incentive mechanisms – namely, that environmental factors should be included in the valuation of assets and services , such as:*

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

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

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

The overall objectives of ESD are to use, conserve and enhance natural resources. This ensures that ecological processes are maintained, facilitating improved quality of life, now and into the future.

JPG and Cooranbong Water are committed to the principles of ESD and understand that social, economic and environmental objectives are interdependent. A well-designed and effectively managed operation will avoid significant and/or costly environmental impact or degradation.

8.3.1 The Precautionary Principle

The precautionary principle, in summary, holds that where there are threats of serious or irreversible environmental damage, the lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

Through the development of the proposal, the consultant team for the EIS :

- Identified the sensitive surface features and implemented design criteria to avoid impacts through:
  - The location of infrastructure in existing disturbance footprints;
  - The location of infrastructure away from sensitive receivers; and
  - The use of existing infrastructure at existing approved limits;
- Commissioned specialist assessments for activities with the potential to significantly impact the community, biodiversity, surface water, groundwater odour and noise that demonstrate certainty of environmental consequences; and
- Developed adaptive mitigation and management measures to take into consideration changes in technology, understanding of issues and implementation of the results of initiatives such as real time air quality monitoring.

Detailed understanding of the issues and potential impacts associated with the proposed development has been obtained via consultation and assessment to a level of detail commensurate with the scale of the proposed development, industry standards and the legislative framework under which the proposed development is permitted.

Specialist assessments, including the use of engineering and scientific modelling, have been undertaken for the design of the proposed development for impacts relating to noise, air quality, greenhouse gas, social issues, surface water, groundwater, biodiversity; economic issues, traffic and transport, visual issues, heritage, contamination, soil, land and agriculture considerations. To this end, there has been careful evaluation undertaken in order to avoid, where possible, serious or irreversible damage to the environment. In the circumstances where avoidance was not possible, appropriately scaled mitigation measures have been developed.

8.3.2 Social Equity, Inter-Generational Equity

Intergenerational equity is centred on the concept that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations. There is a moral obligation to ensure that today's economic progress, which will benefit both current and future generations, is not offset by environmental deterioration.

The primary objective of the proposed development is to provide an alternative to the traditional sewage treatment plant usually required to service new residential developments. The facility will make a significant contribution to sustainability through the provision of recycled water back to the new residential areas.

The various consultation activities that have been undertaken, as outlined in Section 6 and the engagement of suitably qualified and experienced consultants have ensured that the planning, design and environmental assessment phases of the proposed development have been transparent. The contents of this EIS report (including appendices), combined with the consultation activities, has enabled the proponent to understand the potential implications of the proposed development and therefore identify the required management strategies, mitigation measures and monitoring activities to ensure potential for impact is appropriately minimised.

The management strategies, mitigation measures and monitoring programs have been identified to minimise adverse impact upon the local environment and has been placed on anticipation, avoidance and mitigation of potential impacts, as opposed to undertaking later remedial action.

These actions will assist in ensuring that current and future generations can enjoy equal and equitable access to social, environmental and economic resources through the maintenance of the health and diversity of the environment.

8.3.3 Conservation of Biological Diversity and Ecological Integrity

The principle of conservation of biological diversity and ecological integrity holds that the conservation of biological diversity and ecological integrity should be a fundamental consideration for the proposed development.

The potential environmental impacts of the proposed development, including upon ecological communities and habitat values and measures to ameliorate these potential impacts, are detailed within this EIS. The proposed development has sought to avoid, minimise and mitigate potential impacts on ecological values within the site through a risk-based approach that avoids impacts on the surrounding ecology through the use of the existing disturbance footprint where ever possible. Where additional disturbance is proposed consideration has been given to a range of potential environmental impacts, including biodiversity.

8.3.4 Improved Valuation and Pricing of Environmental Resources

The principle of improved valuation, pricing and incentive mechanisms deems that environmental factors should be included in the valuation of assets and services. The cost associated with using or impacting upon an environmental resource is seen as a cost incurred to protect that resource. Bases for evaluating costs relating to issues of noise, air quality, greenhouse gas emissions, soil and water, traffic and transport, biodiversity, heritage and visual aspects, utilising valuation methods derived from studies accessed through relevant government bodies, have been used in the preparation of the EIS.

Whilst clear and widely accepted standards have not yet been established for the application of this principle (to date there are few widely accepted methods by which monetary values are attributed to environmental factors), JPG and Cooranbong Water has, through the economic assessment for the proposed development, researched the available literature to determine appropriate measures for environmental factors. This approach acknowledges and accepts the financial costs associated with all the measures required for the proposed development to avoid, minimise, mitigate and manage potential environmental and social impacts.

9.0 Conclusion

The EIS has been prepared to consider the environmental, social and economic impacts of the proposed water recycling facility (Cooranbong LWC). The EIS has addressed the issues outlined in the SEARs contained in **Appendix 2** and accords with Schedule 2 of the EP&A Regulation with regards to the consideration of the relevant environmental planning instruments, the proposed built form and environmental impacts including flora and fauna, heritage, surface and groundwater hydrology, flooding, human health, air quality, traffic and visual amenity.

The site is approximately 1.4 ha in size and is zoned 10 Investigation under LM LEP 2004. The proposed development will result in the future use of the site for the purposes of a water recycling facility and will provide a service essential for the continued development of the North Cooranbong Residential Precinct.

Having regard for the biophysical, economic and social considerations, including the principles of ecologically sustainable development, the carrying out of the proposed development is justified for the following reasons:

- The proposed development is permissible with consent and meets the requirements of the relevant statutory planning controls;
- The proposed development is consistent with the principles of ecological sustainable development as defined by Schedule 2 Clause 7(4) of the EP&A Regulation;
- The proposed development will not result in any unacceptable adverse impacts on existing and future surrounding buildings and uses;
- The proposed facility building establishes a building form with appropriate scale and massing that responds to the site's setting and topography;
- The proposed development will not result in any significant adverse impacts on local flora and fauna;
- The existing traffic network has sufficient capacity to cater for the proposed development;
- The proposed development will not result in any unacceptable adverse amenity impacts on nearby rural residential properties;
- The proposed development is capable of being adequately serviced with potable water and electrical and communication services;
- An assessment of the site's heritage values has been undertaken and determined that the impacts of the proposed development from a heritage perspective are acceptable;
- The proposed development will benefit the community by ensuring supply of affordable housing for the Lake Macquarie area and through the provision of recycled water to future development within the North Cooranbong Residential Precinct; and
- It will allow the North Cooranbong Residential Precinct to be developed in a continued and timely manner, consistent with the Concept Approval (MP 07-0147).

In light of the environmental, social and economic benefits of the proposed development and the planning merit and significant public benefits associated with the proposed development, it is recommended that this application be approved.

10.0 Terms and Abbreviations

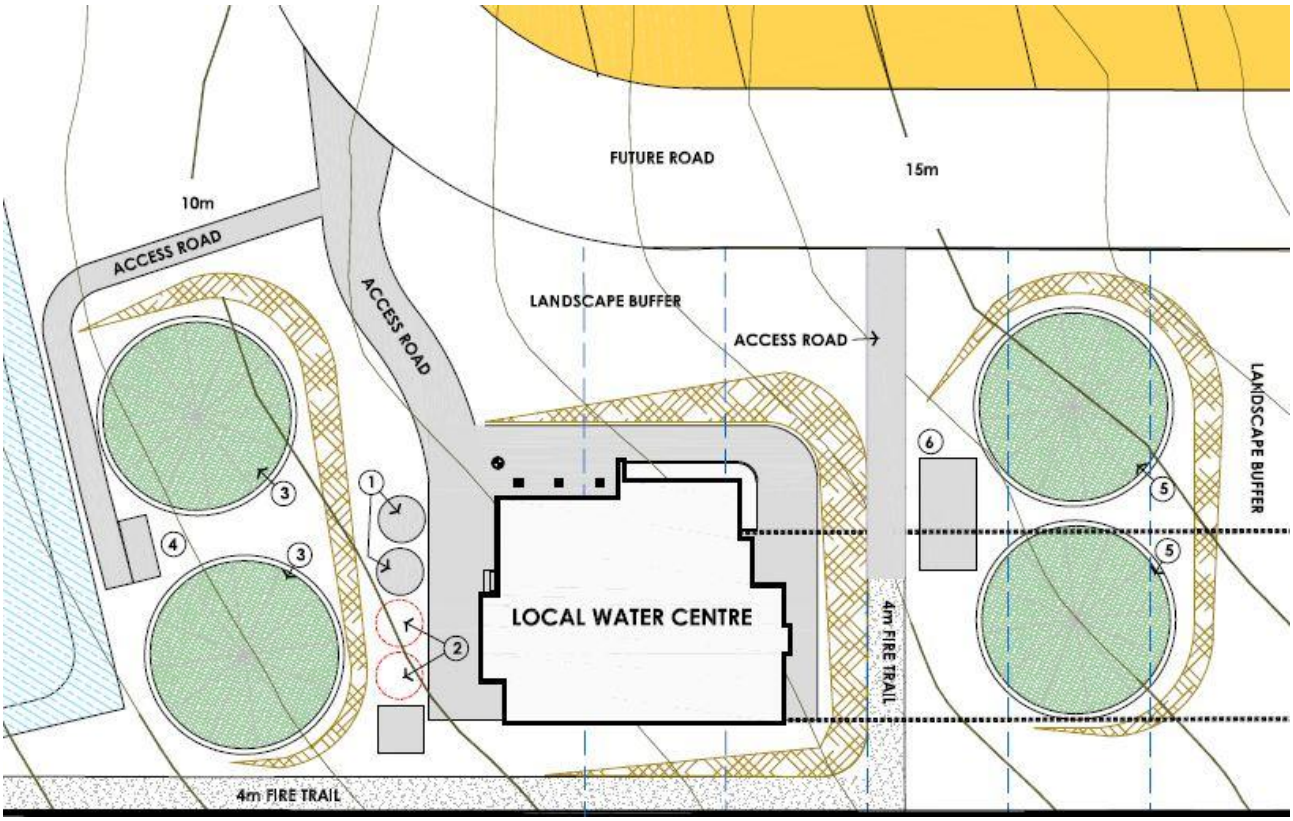
Abbreviation	Meaning
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
BCA	*Building Code of Australia*
CC	Construction Certificate
CEMP	Construction Environmental Management Plan
CLM Act	*Contaminated Land Management Act 1977*
Cooranbong LWC	Cooranbong Local Water Centre
Cooranbong Water	A private water utility wholly owned by Flow Systems Pty Ltd.
DCP	Development Control Plan
DoPE	Department of Planning and Environment
Draft LM LEP 2014	Draft Lake Macquarie Local Environmental Plan 2014
EA	Environmental Assessment
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999*
FBT	Flow Balance Tanks
Flow Systems	Flow Systems Pty Ltd, the parent company of Cooranbong Water.
Heritage Act	*Heritage Act 1977*
HWC	Hunter Water Corporation
IMP	Incident Management Plan
INP	*NSW Industrial Noise Policy*
IPART	Independent Pricing and Regulatory Tribunal
JPG	The proponent, Johnson Property Group
LEP	Local Environment Plan
LGA	Local Government Area
LMCC	Lake Macquarie City Council
LM LEP 2014	Lake Macquarie Local Environmental Plan 2004
LWC	Local Water Centre
MNES	Matters of National Environmental Significance
NPW Act	*National Parks and Wildlife Act 1977*
OEH	Office of Environment and Heritage
PBP 2006	*Planning for Bushfire Protection 2006*
POEOA Act	*Protection of the Environment Operations Act 1997*
REF	Review of Environmental Factors
RMS	Roads and Maritime Services
RNP	*NSW Road Noise Policy*

Abbreviation	Meaning
SEAR	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
TSC Act	*NSW Threatened Species Conservation Act, 1995*
WICA	*Water Industry Competition Act 2006*
WRF	Water recycling facility
WWTP	Waste Water Treatment Plant

Appendix 1

Concept Plan and Architectural Drawings

Cooranbong LWC – Concept Plan



Cooranbong LWC – Oblique View

Appendix 2

Secretary's Environmental Assessment Requirements (SEARs)

NSW GOVERNMENT | Planning & Environment

Contact: Chris McGillick
Phone: 02 9228 6393
Fax: (02) 9228 6455
Email: chris.mcgillick@planning.nsw.gov.au

Mr Stuart Greville
Senior Environmental Planner
RPS
PO Box 428
Hamilton NSW 2303

Dear Mr Greville

Subject: Secretary's Environmental Assessment Requirements for water recycling facility and at Cooranbong

Your application requesting Secretary's Environmental Assessment Requirements for the preparation of an Environmental Impact Statement for the above project was received on 1 May 2014.

A copy of the Secretary's Environmental Assessment Requirements (SEARs) for the project as Attachment 1. Attachment 2 outlines the statutory matters that must be included in any EIS prepared in accordance with Part 4 of the *Environmental Planning and Assessment Act 1979.*

The Department consulted with the Department of Primary Industries (DPI), and with other relevant government authorities in developing these requirements. Key considerations have been incorporated into the DGRs; however it is recommended that you consider all matters raised in preparing your EIS. A copy of comments is provided for your information (Attachment 3). Comments have not been received from the NSW Office of Water (part of the Department of Primary Industries). You should consult directly with this agency regarding their requirements.

If other integrated approvals are identified before the Development Application (DA) is lodged, you must undertake your own consultation with relevant agencies and address their requirements in the EIS.

When you lodge the DA for the proposal, you must provide:

- a suitable number of copies of the EIS to each integrated approval authority (you should consult each agency to determine the number of copies required); and
- a cheque for $320 to each integrated approval authority, to offset costs involved in the review of the DA and EIS.

If your project is likely to have a significant impact on matters of National Environmental Significance, it may require an approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). This approval would be in addition to any approvals required under NSW legislation. Any questions about the application of the EPBC Act to your proposalshould be directed to the Department of the Environment in Canberra on (02) 6274 1111 or http://www.environment.gov.au.

Your contact officer for this proposal, Chris McGillick, can be contacted on 02 9228 6393 or via email at chris.mcgillick@planning.nsw.gov.au. Please mark all correspondence regarding the proposal to the attention of the contact officer.

Yours sincerely,

23.6.14

Karen Jones
Director
Infrastructure Projects

ATTACHMENT 1

Secretary's Environmental Assessment Requirements

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

Proposal	Water recycling facility at Cooranbong, within the Lake Macquarie local government area
Location	617 Freemans Drive, Cooranbong NSW 2265; lot 12 DP 1158508
Applicant	Johnson Property Group
Date of Issue	10 June 2014
General Requirements	The Environmental Impact Statement (EIS) must meet the minimum form and content requirements in clauses 6 and 7 of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*.
Key Issues	The EIS must assess the following potential impacts of the proposal: ▪ **A detailed description of project** ▪ **Project justification** – including alternative sites and technologies; ▪ **Land use** – detail the impact on and from surrounding current and future land uses, including issues relating to managed adjoining areas and an analysis of site suitability with respect to potential land use conflicts. This assessment must consider the odour and visual amenity impact on the proposed water recycling facility on future residential land uses, and the impact of the proposal on future employment land within the Wilton site. The assessment must also consider all planning agreements applicable to the site; ▪ **Flora and fauna** – impacts on terrestrial, riparian and aquatic flora and fauna and habitat, and groundwater dependent ecosystems, within and surrounding the proposed development footprint, taking into account threatened species, ecological communities and critical habitat listed under the *Threatened Species Conservation Act 1995* and *Fisheries Management Act 1994,* including consideration of activities requiring approval or concurrence under the *Fisheries Management Act 1994*. Offset requirements must be considered as part of the assessment. The assessment must also take into account the Cumberland Plain Recovery Plan, and any existing Species Impact Statement(s) relevant to the proposal area; ▪ **Heritage** – impacts on both Aboriginal cultural heritage and non-Aboriginal heritage; ▪ **Surface and groundwater hydrology** – impacts on creeks and waterways, including potential impacts on groundwater levels, salinity, and including potential contamination of groundwater, flooding impacts, and downstream water quality. This assessment must include likely application rates and precautionary discharges and overflows, and a water balance assessment showing the movement of water and impacts, including those to groundwater during wet and dry periods. The assessment must include a concept stormwater plan including surface water drainage patterns; ▪ **Flooding** – flood impacts to and from the facility, including constraints to detailed design and impacts on the operation of the infrastructure, and contingency measures in the event of operational impacts due to flooding; • **Soil and water quality** – detail the potential occurrence of contaminated soils and likely impacts from the disturbance of those soils, including impacts on water quality. This must include an assessment of contamination resulting from the proposal. The assessment must detail what the potential for contamination will be and the water quality expected to be output by the facility; • **Waste generation and hazards** – include an assessment of the waste generated by the facility, what chemicals would be used and stored on the site, assessment

	of hazards and risk including details of the waste handling and disposal or chemicals during construction and operation and identification of management measures associated with operation; • **Human health** – the assessment must identify any change to risk to human health from the output of the facility, including mitigation measures and management to ensure appropriate standards are met; • **Air Quality** – include an assessment of the odour impacts associated with operation of the WRF, prepared by an appropriately qualified person. The odour analysis shall be undertaken in accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (DEC, 2005) and draft *NSW Best Practice Odour Guideline Sewerage systems including sewage treatment plants, water recycling facilities, sewage reticulation systems and sewer mining* (DoP 2010), dust impacts to nearby receivers should be assessed; • **Noise and vibration** – detail the likely impacts during construction and operation (from construction machinery and haulage vehicles); • **Traffic** – include an assessment of impacts to the local road network, including direct impacts from construction or operational traffic; • **Visual Amenity** – include an assessment of changes to visual amenity, with reference to surface components and vegetation removal and include proposed mitigation measures, including proposed landscaping and other visual screening; and • **Environmental Monitoring and Management** – the EIS must describe in detail what measures would be implemented to manage, mitigate or offset the potential impacts of the proposal (as identified above) during construction and operation as relevant, and where required, describe how the environmental performance of the proposal would be monitored and managed over time. Where possible, reasonable and feasible mitigation measures should be developed in consultation with surrounding affected landowners and relevant public authorities.
Planning Documents and Environmental Planning Instruments	The EIS must assess the proposal against the relevant legislation, planning documents and environmental planning instruments, including, but not limited to: • *State Environmental Planning Policy (Infrastructure) 2007;* • *State Environmental Planning Policy No 55 – Remediation of Land*; • *State Environmental Planning Policy No 33 – Hazardous or Offensive Development;* • *Lake Macquarie Local Environmental Plan 200;* • *Draft Lake Macquarie Local Environmental Plan 2014;* • *Lake Macquarie Development Control Plan; and* • *Lake Macquarie Draft Development Control Plan 2014.*
Guidelines	It is recommended that during the preparation of the EIS you consider the following listed guidelines, studies and policies, and any other relevant documents discovered during the preparation of the EIS. 1. *EIS Guidelines – Sewerage Systems* (DUAP, 1996); 2. *Australian Water Quality Guidelines for Fresh and Marine Waters* (ANZECC 2000); 3. *NSW Aquifer Interference Policy* (DPI, 2013); 4. *Interim Construction Noise Guidelines* (DECC 2009) and *Industrial Noise Policy* (EPA, 2000); 5. *Threatened Species Assessment Guidelines: The Assessment of Significance* (DECC 2007); 6. Draft *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (DEC, 2005) and *NSW Heritage Manual* (DUAP, 1996);

	7. *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (DEC, 2005) and draft *NSW Best Practice Odour Guideline Sewerage systems including sewage treatment plants, water recycling facilities, sewage reticulation systems and sewer mining* (DoP 2010); and 8. *Crime Prevention and the Assessment of Development Applications* (DUAP, 2001).
Plans and Documents	The EIS must include all relevant plans, diagrams and relevant documentation required under Schedule 1 of the Regulation. These items are to be provided as part of the EIS rather than as separate documents.
Consultation	You must undertake an appropriate and justified level of consultation with relevant parties during the preparation of the EA, including: ▪ local, State or Commonwealth government authorities and service providers including NSW Health, the Environment Protection Authority, the Office of Environment and Heritage, the Department of Primary Industries (including the NSW Office of Water), local catchment management authority, Hunter Water, the Mines Subsidence Board, Roads and Maritime Services and Lake Macquarie City Council; ▪ specialist interest groups, including local Aboriginal land councils; and ▪ the local community, including affected landowners. The EA must describe the consultation process, document consultation undertaken and identify any issues raised (including where these have been addressed in the EA).
Further Consultation After Two Years	You should note that if the Development Application to which these requirements relate is not made within two years of the date of issue, you must re-consult with the Secretary prior to lodging the application.
Administration	In accordance with Section 113 of the EP&A Act, Council must ensure that copies of the EIS are exhibited at the Department's offices.

ATTACHMENT 2

STATUTORY REQUIREMENTS FOR THE PREPARATION AND EXHIBITION OF AN ENVIRONMENTAL IMPACT STATEMENT UNDER PARTS 4 AND 5 OF THE ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979

In accordance with the *Environmental Planning and Assessment Act 1979* (the EP&A Act), an environmental impact statement (EIS) must meet the following requirements.

Content of EIS

Pursuant to Schedule 2 and clauses 72 and 230 of the *Environmental Planning and Assessment Regulation 2000* (the *Regulation*), an EIS must include:

1. A summary of the environmental impact statement.
2. A statement of the objectives of the development or activity.
3. An analysis of any feasible alternatives to the carrying out of the development or activity, having regard to its objectives, including the consequences of not carrying out the development or activity.
4. An analysis of the development or activity, including:
   (a) a full description of the development or activity; and
   (b) a general description of the environment likely to be affected by the development or activity, together with a detailed description of those aspects of the environment that are likely to be significantly affected; and
   (c) the likely impact on the environment of the development or activity, and
   (d) a full description of the measures proposed to mitigate any adverse effects of the development or activity on the environment, and
   (e) a list of any approvals that must be obtained under any Act or law before the development or activity may be lawfully carried out.
5. A compilation, (in a single section of the environmental impact statement) of the measures referred to in item 4(d).
6. The reasons justifying the carrying out of the development or activity in the manner proposed, having regard to biophysical, economic and social considerations, including the following principles of ecologically sustainable development:
   (a) The precautionary principle - namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

   In the application of the precautionary principle, public and private decisions should be guided by:
      (i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and
      (ii) an assessment of the risk-weighted consequences of various options,
   (b) Inter-generational equity - namely, that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations,
   (c) Conservation of biological diversity and ecological integrity, namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration,
   (d) Improved valuation, pricing and incentive mechanisms, namely, that environmental factors should be included in the valuation of assets and services, such as:
      (i) polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,
      (ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,
      (iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

An environmental impact statement referred to in Sections 78A(8) and 112 of the *EP&A Act* shall be prepared in written form. The prescribed form to accompany the environmental statement must comply with requirements of clauses 71 and 229 of the *Regulation* and be signed by the person who has prepared it.

Procedures for public exhibition of the EIS are set down in clauses 77 to 81 and 234 to 235 (under Parts 4 and 5 respectively) of the *Regulation*.

Attention is also drawn to clause 283 of the *Regulation* regarding false or misleading statements in EISs.

Nominated Determining Authority
Where there are a number of determining authorities (as defined under Part 5 of the *EP&A Act*), Section 110A of the *EP&A Act* provides for the Minister to make one of them the nominated determining authority. This avoids duplication of procedures and simplifies the exhibition of the EIS.

It is recommended that you discuss with the other determining authorities which one should become the nominated determining authority and advise the department accordingly. Normally it is the proponent agency that becomes the nominated determining authority. The written agreements of all other determining authorities must be forwarded with the request to be made the nominated determining authority.

It should be noted that the onus is on the proponent agency to identify all other potential determining authorities.

Public Exhibition
When the EIS has been completed, four (4) copies should be forwarded to the Department (Attention: Director, Infrastructure Assessments) pursuant to Section 112(2) of the Act, together with details of the exhibition period and public display locations.

This should occur prior to public exhibition of the EIS in order that simultaneous exhibition of the EIS occurs in the offices of the Department of Planning and determining authority as required by Section 113 of the Act and clause 235 of the Regulation.

It is requested that a CD ROM copy of the EIS be also supplied.

Note

Should the EIS not be exhibited within 2 years from the date of issue of the Director-General's requirements, under clauses 73 and 231 of the *Regulation* the proponent is required to re-consult with the Director-General.

Submissions and Representations
Any submissions (Part 4) and representations (Part 5) made in response to public exhibition of the EIS should, as soon as practicable and not less than 21 days before determining the activity, be forwarded to the Department in accordance with clause 81 of the Regulation and section 113(3) of the Act

ATTACHMENT 3
Government Authority Responses to Request for Key Issues
For Information Only

Appendix 3

Agency and Community Consultation

Community Meeting

On Tuesday May 27 2014, Johnson Property Group will be holding a community meeting at Cooranbong Community Services Centre (Community Hall), 614 Freemans Drive, Cooranbong, from 7pm to 8.30pm.

Brian Elton, Managing Director Elton Consulting will facilitate the evening and the community is encouraged to attend, as information in relation to the North Cooranbong subdivision's proposed local water centre and recycled water scheme will be discussed.

Bryan Garland, Development Director Johnson Property Group and Terry Leckie, Managing Director Flow Systems will answer questions from the community.

North Cooranbong Subdivision Community Meeting

Date: Tuesday May 27 2014
Time: 7pm to 8.30pm
Venue: Cooranbong Community Services Centre (Community Hall), 614 Freemans Drive, Cooranbong

flow systems

JOHNSON PROPERTY GROUP

North Cooranbong Community Meeting Notes

Meeting	**North Cooranbong community meeting regarding proposed Local Water Centre and recycled water scheme**				
Date	27 May 2014	**Venue**	Cooranbong Community Services Centre, 614 Freemans Drive, Cooranbong	**Time**	6:45pm – 8.30pm
Presenters	• Brian Elton - Managing Director, Elton Consulting (*Facilitator*) • Bryan Garland - Development Director, Johnson Property Group (JPG) • Terry Leckie - Managing Director, Flow Systems				

Apologies	• Hunter Water Corporation
	• Lake Macquarie City Council
	  ○ Mayor – Cr. Jodie Harrison
	  ○ Cr. Ken Paxinos
	  ○ Cr. Jason Pauling				

1	**Welcome** Brian Elton welcomed attendees and outlined the objective of the meeting. Objective: To brief the Cooranbong community on the proposed Local Water Centre and recycled water scheme for the North Cooranbong subdivision. To respond to questions from the community about the proposed Local Water Centre and recycled water scheme. Outline of opportunity to visit Flow Systems' facility in Pitt Town.				
2	**Presentation One** **North Cooranbong – planning process overview** Bryan Garland outlined the planning process involved in the development of the Local Water Centre. Both a proposal to rezone the land and separately a development application have been submitted to the Lake Macquarie City Council for the site. Thirdly, an application to IPART for a WICA (Water Industry Competition Act) license is scheduled to be submitted early June 2014. The issue of a license by IPART is pending either Council's approval of the rezoning application or the development application. Bryan outlined the location of the Local Water Centre site at 617 Freemans Drive.				
3	**Questions** *The following table includes the questions and responses discussed at the community meeting in relation to Bryan Garland's presentation. Those questions that could not be answered were taken on notice and the responses to these questions can be found below.*				
	Question/comment		**Response**		
	3.1 Is a Council representative here		BE: A number of Council representatives		

	tonight?	were invited to this event and we note a number of apologies from Council. *No person from the audience identified themselves as a member of Council.*
	3.2 If this technology has been around for a while, why wasn't this technology included as part of the Masterplan and placed at the physical centre of the planned development instead of the edge?	BG: The full suite of legislation (including Act and Regulations) opening up competition in the water industry was only gazetted at the end of 2008. This came into effect at the later end of the Masterplan approval process.
	3.3 Given that this Masterplan predates the agreement between COAG and the federal government, shouldn't this development be referred to SEWPAC and why was this not mentioned? I understand that two types of vegetation have already been referred.	BG: This development will only be referred to SEWPAC if it is found to impact on matters of national environmental significance. The whole of the previous Masterplan was referred to SEWPAC and environmental requirements have been placed on the land. The Local Water Centre site falls outside of that consideration.
	3.4 Does the rezoning for the new site at 617 Freemans Drive also include a residential application?	BG: Yes that is correct.
	3.5 Why did JPG originally put forward a recommendation for moratorium against further residential rezoning as part of JPG's 2013 submission on the draft Lower Hunter Regional Strategy?	BG: The Department of Planning has already rezoned approximately 50% of the land area identified for residential development from the August 2006 Lower Hunter Regional Strategy. In the absence of an infrastructure plan that supported the Lower Hunter Regional Strategy, we suggested that a moratorium should be placed on rezoning additional release areas that are further away from current infrastructure. 617 Freemans Drive is immediately adjacent to a State Significant Site release area and can be serviced with critical infrastructure.
	3.6 Who was the NSW Planning Minister when you put this project through?	BG: The approved Part 3A concept plan was signed by Kristina Keneally.

4	**Presentation Two** **Proposed Local Water Centre and recycled water scheme** Terry Leckie outlined who Flow Systems are, why they are involved in this infrastructure project, the function and processes of the Local Water Centre and the recycled water scheme. Flow Systems came into being in response to a government policy to create self-reliant communities and to allow private companies into the water services industry to create innovation and competition in the marketplace. To support this policy, the government introduced the Water Industry Competition Act of 2006. Flow Systems is a private water utility. Its licenses have been issued by the Minister for Finance and Services under the Water Industry Competition Act. Each time Flow Systems would like to offer their services to a new community they are required to obtain a new license. Flow Systems is currently contracted to provide water utility services to eight communities across the state. **The Centre:** The proposed Local Water Centre would be similar to the one currently operating in Pitt Town. The Pitt Town facility is the size of a large four bedroom house and has two large tanks beside it. This site has been architecturally designed. The site causes no more vehicle traffic than a normal residence, being serviced by the garbage collection once a week. There are no large trucks on the site, only the operator's ute. There are also no operator's permanently located on-site. **Homes:** Each home would feature a small sewer pump contained within a collection tank buried underground on the property. A small control box would also be placed on the side of each house. This control box allows Flow Systems to measure water usage in real time, identify potential leaks, and control the sewer pump. **Treatment of sewage:** Sewage is treated using a seven step process, including a membrane bioreactor, UV disinfection and chlorination. Recycled water will then be delivered to houses for toilet flushing, clothes washing and irrigation. **Operating philosophy:** Flow Systems is looking to employ plumbers and electricians from the local community to service the local reticulation network (water and sewer pipes and valves) and the residential infrastructure (e.g. sewer pumps, water meters etc.) Flow Systems will also be responsible for delivering drinking water sourced from Hunter Water to people's homes via separate pipes.

5	**Comments from Dr. Brian Timms** Dr Timms asked to make a few comments. Dr Timms mentioned that he was previously concerned about the operation of Flow Systems' recycled water system, however he no longer has this concern. He raised the issue of small levels of phosphate and nitrate leaking into the local gullies and waterways over the next 20-40 years, and highlighted that this process would be the same as the one used by Hunter Water and result in the same outcome. Terry Leckie agreed that this was a long-term issue and was happy to provide more information to the community about how Flow Systems would manage this.	
6	**Questions** *The following table includes the questions and responses from Terry's presentation discussed at the community meeting. Those questions that could not be answered were taken on notice and the responses to these questions can be found below.*	
	Question/comment	**Response**
	6.1 Instances of flooding in the area occur approximately every 5-6 years. These events can happen extremely quickly with little warning, resulting in large amounts of rain falling in only a few hours. How will you work with Hunter Water and what is your contingency in case of such an event?	TL: We are working with Hunter Water closely on a number of projects. We will have a protocol for notifying Hunter Water in the case of an event where it might affect their infrastructure. Our sewerage system is separate from stormwater and can continue to operate under flood conditions.
	6.2 Will the release of phosphates into the natural environment be addressed in the EIS?	TL: Yes this will be done as part of the EIS process.
	6.3 Are you happy to talk about another matter to do with the development project other than water?	BE: The focus of this community meeting is on water management.
	6.4 Where do you get rid of solid waste?	TL: There is a little bit of rubbish that is macerated (when passing through the grinder pumps) and screened that goes to landfill in the regular council garbage collection service until the volume is large enough to warrant a skip bin collection.
	6.5 At full build out, what is the volume of solid material that needs to be removed? How frequently is solid material removed	*Question taken on notice.* There are two scenarios for waste generation: liquid waste (excess

	and by what means?	wastewater) and solid waste (as a by-product of the treatment process). For liquid waste (eg. for short-term periods when there isn't sufficient demand for recycled water to keep up with the wastewater being generated by the community), our preference is to negotiate an agreement with Hunter Water to use their existing sewerage network to discharge any excess wastewater into. Solid waste disposal options will be considered in accordance with industry best practices for biosolids management. We are happy to keep the community informed, either through formal consultation processes or ongoing conversation as we develop these options.
	6.6 Will you be offering your services of capturing water, for example stormwater, for other homes in the community?	TL: Our services will include collection of wastewater, and providing drinking water and recycled water.
	6.7 How does the system cope with cleaning products that kill the organisms used to break down the sewage?	TL: We will distribute information to new residents about how to use the system. All of the collected wastewater is mixed up in the Local Water Centre's balance tank, which dilutes cleaning products before the wastewater enters the bioreactor, to the extent that they don't typically affect the treatment process.
	6.8 How do you compensate people for damages should there be any problems with your system?	TL: We have a customer contract with each customer of our services. This agreement has been reviewed by IPART (the NSW Government regulator of private water utilities).
	6.9 How long would it take for someone to fix any potential problem?	TL: Our monitoring of the system allows us to see if we have a burst or any

		unusual flows (eg. leaks) and where these are. We will employ plumbers in your local community who will help build the system and will be on call just down the road.
	6.10 How long does your piping last?	Our water and sewer networks (including piping) are designed and constructed in accordance with standard design guidelines published by the Water Services Association of Australia (WSAA), which is the peak industry body for the Australian urban water sector. <u>Additonal information provided on notice:</u> Our piping is made from the same materials, eg. high density polyethylene (HDPE) and PVC pressure pipe as specified by WSAA and widely used throughout Australia by public water authorities. These pipes are designed to have the same life expectancy as a typical domestic building, ie. more than 50 years, and real experience in Europe has shown that buried PVC pressure pipes dug up after 60 years of active use were proven to be fit for purpose when analysed and likely to have a further life expectancy of 50 years.
	6.11 What is the capacity of your facility should further development occur?	TL: For us to be sustainable we need to service 1,000 or more homes. This facility will have a capacity of 2,500 homes. If we need to service another community, we would build a new facility in a new location.
	6.12 Will the cost of running this piece of infrastructure be reduced if you are servicing 2,500 homes as opposed to 1,000?	TL: No, our consumer prices are the same as those of Hunter Water. We commit to that in our customer contracts. As the number of homes increase, a sinking fund is established so that we can renew our facilities and infrastructure. It is part of our legislative requirements to

		have sufficient funds to maintain our infrastructure so that it continues to operate at suitable standards.
	6.13 Will the sewer pumping station originally proposed for 60 Avondale Road be going ahead?	TL: No.
	6.14 Given that the system is under pressure, does this mean that it can leak untreated sewage into the soil?	TL: For our pressure sewer systems we use thick-walled HDPE piping and fusion welded joints, meaning there is much less likelihood of leakage than in traditional gravity piping systems. Our remote monitoring will identify leaks so we can fix them promptly.
	6.15 Would you be planning to intercept the current sewerage system?	TL: No, we do not plan to carry out sewer mining.
	6.16 Do you propose to harvest stormwater?	TL: If there is no benefit from it, then no we won't be doing that.
	6.17 In your application to Council, you have mentioned that this development is scalable.	TL: This refers to our plan to build this Local Water Centre in stages. <u>Additional notes:</u> The major construction phase will occur in one stage and then equipment will be added in stages.
	6.18 In your application you refer to two tanks up to 7 metres high.	TL: We have been generous in our application to Council in regards to height. Similar tanks in Pitt Town are four and a half metres high. We will be investigating suggestions made to partially sink the tanks to reduce their height.
	6.19 Is there noise or odour emitted from the site?	TL: In similar systems there is no detectable odour beyond the boundary of the property that the Local Water Centre is located. This will be investigated as part of the EIS and verified by the facility design.
	6.20 The application for 60 Avondale Road was withdrawn on the grounds of proximity to residential properties. Why are you allowing this centre to be so close to	BG: Unlike traditional treatment works (like Marconi Road, Dora Creek), the proposed facility at this site is a closed system and there are no minimum

	residential housing at this location?	distance requirements in regards proximity to residential property. At this new site, we will be developing our own residential lots around 40-50 metres from the Local Water Centre.
	6.21 What happens if we can smell it?	TL: If there are concerns about odour we will work with the community to ensure that appropriate mitigation actions are promptly taken.
	6.22 What happens if Flow Systems goes into liquidation?	TL: This is part of our licensing agreement. The Minister for Finance and Services will trigger contingency plans if we are in breach.
	6.23 What is the contingency allowance on your equipment?	TL: We have 100% contingency and redundancy allowances.
	6.24 When we have heavy rain we have discoloured water coming into the lake. Last time this happened four eels and 24 fish died.	*Comment noted.*
	6.25 You have paid $1.4 million for this property. Have you had any contact with Council and how sure are you that this rezoning will go through?	BG: We had no contact with Council prior to the acquisition of the land. The rezoning is entirely up to the Council. The cost is a development risk we are taking.
	6.26 Was this proposition put to you by Council or was it an independent decision?	BG: This system was JPG's decision and we had not spoken to Council or Hunter Water Corporation about it prior to the acquisition.
	6.27 Does Flow Systems deal with stormwater?	TL: No.
	6.28 If you have mixed biological digesters breaking down sewage, will that result in methane gas and other substances?	TL: Our system uses a membrane bioreactor not a digester system, which does not produce methane gas or other similar substances.
	6.29 What happens to synergistic and manufactured hormones that go through food and human viruses that your system isn't able to detect? What guarantees do you have to detect these?	*Question taken on notice.* Flow Systems' refined water will be free of all bacteria, protozoa and viruses. This is a condition of our operating licence, and is closely monitored by government

		regulatory bodies. Residual hormone levels in water of any quality is a global issue. It currently exists across all communities in Australia and Flow Systems is no different from any other water utility in that regard. We will work constructively with regulators to meet all license conditions, including those relating to hormones.
	6.30 If Hunter Water Corporation and Council have not encouraged JPG to go down this path, why are we not also being offered a plan through Hunter Water Corporation?	BG: Servicing the land with Hunter Water Corporation infrastructure was originally envisaged and we had Hunter Water Corporation approved servicing strategies for recycled, sewer and drinking water. But with the introduction in 2008 of WICA legislation and as new technology comes on board, a lot of developers are taking the opportunity to use private groups. BE: This is also a policy platform promoted by government.
	6.31 Why should the rest of us have to have this in our community if we do not benefit?	BG: We have to discharge sewer and produce recycled water somewhere.
	6.32 Who owns Flow Systems?	TL: We are a private company, 51 per cent owned by Brookfield Infrastructure. There are five other shareholders.
	Summary and next steps Brian Elton thanked attendees and presenters for their time. Attendees were advised that they would be able to sign up to receive the notes of the meeting and for the excursion to visit Flow Systems' Local Water Centre in Pitt Town.	

Rob Dwyer

From: Philippe G. Porigneaux [Philippe.Porigneaux@hnehealth.nsw.gov.au]
Sent: Wednesday, 6 August 2014 1:03 PM
To: Nichole L. Ansell
Cc: Rob Dwyer
Subject: FW: Proposed Enironmental Impact Statement (EIS) for a recycled water facility at Cooranbong
Attachments: 617 Freemans Dr, Cooranbong NSW 2265, Australia.kmz; nswglobe(1).kml; 20140623 _signed SEARs Cooranbong Water Recycling Facility 23-6-14.pdf; 122011 Figure 1 Planning A A4.pdf; 2827-P010-SITE PLAN (5)-20140515.pdf; Cover letter - application for DGRs.pdf

Dear Nichole,

I've just had a phone conversation with Rob Dwyer from RPS Australia Asia Pacific.

There is a WICA process for a recycled water scheme at Cooranbong. Note attached documents.

An EIS (not a State Significant Development) will soon be lodged with Lake Macquarie Council. We should therefore ensure that we review the EIS when on Public Exhibition through Lake Macquarie Council.

Rob is going to reply to this email with additional documentation in relation to the treatment train for the recycle scheme. When provided, can you please respond to Rob and provide your signature block.

Regards

Philippe

Philippe Porigneaux

Environmental Health Manager | **Hunter New England Population Health**
Locked Bag 10 WALLSEND NSW 2287
Tel 02 4924 6494 | Fax 02 4924 6490 | Mob 0408 491 962 | philippe.porigneaux@hnehealth.nsw.gov.au
www.health.nsw.gov.au

NSW GOVERNMENT Health
Hunter New England
Local Health District

From: Rob Dwyer [mailto:Rob.Dwyer@rpsgroup.com.au]
Sent: Wednesday, 30 July 2014 2:59 PM
To: Philippe G. Porigneaux
Subject: Proposed Enironmental Impact Statement (EIS) for a recycled water facility at Cooranbong

Hello Philippe

I was provided your name through the switch board of NSW Health.

RPS is a planning consultancy and been engaged by the Johnson Property Group to seek development consent for it to construct a recycled water facility (WRF) to service the approved North Cooranbong residential development.

The WRF will be located on a portion of 617 Freemans Drive, Cooranbong (Lot 12 DP 1158508).

The development has been declared a designated development under Part 29 Schedule 3 of the EP&A Regs. as the development is defined as a sewerage system and is located within 250m of a dwelling not associated with the development.

We have obtained the SEARs from DPE (attached) which included the need to consult with NSW Health.

Can you please review the attached documentation and provide a response.

I will give you a call in couple of days to see if you have any questions.

Regards

RPS

Rob Dwyer
Planning Manager - Newcastle
RPS Australia Asia Pacific
PO Box 428, Hamilton, NSW, Australia, 2303
241 Denison St, Broadmeadow, NSW, 2292
Tel: +61 2 4940 4200
Fax: +61 2 4961 6794
Email: Rob.Dwyer@rpsgroup.com.au
www: http://rpsgroup.com.au

Rob Dwyer

From: Jesse Gollan [jesse.gollan@lls.nsw.gov.au]
Sent: Monday, 4 August 2014 11:57 AM
To: Rob Dwyer
Subject: Re: Cooranbong Local Water Centre - EIS

Hi Rob

This information has been forwarded to the relevant officers. They will handle the response and will be in touch shortly.

Regards

Jesse Gollan

Senior Land Service Officer - PVP's
Hunter Local Land Services
PO Box 440
Taree NSW 2430
Phone: (02) 6551 8994 xtn 221
Mobile: 0427 923 621
Fax: (02) 6552 2047
jesse.gollan@lls.nsw.gov.au

On 1 August 2014 15:00, Rob Dwyer <Rob.Dwyer@rpsgroup.com.au> wrote:

Hi Jesse

Thanks for returning my call yesterday.

As discussed RPS is a planning consultancy and been engaged by the Johnson Property Group to seek development consent for it to construct a recycled water facility (WRF) to service the approved North Cooranbong residential development.

The WRF will be located on a portion of 617 Freemans Drive, Cooranbong (Lot 12 DP 1158508).

The development has been declared a designated development under Part 29 Schedule 3 of the EP&A Regs. as the development is defined as a sewerage system and is located within 250m of a dwelling not associated with the development.

We have obtained the SEARs from DPE (attached) which included the need to consult with NSW Health.

Can you please review the attached documentation and provide a response.

Regards

Rob Dwyer
Planning Manager - Newcastle
RPS Australia Asia Pacific

PO Box 428, Hamilton, NSW, Australia, 2303
241 Denison St, Broadmeadow, NSW, 2292

Tel: +61 2 4940 4200
Fax: +61 2 4961 6794
Email: Rob.Dwyer@rpsgroup.com.au
www: http://rpsgroup.com.au

Hunter Water Corporation
ABN 46 228 513 446

PO Box 5171
HRMC NSW 2310
36 Honeysuckle Drive
NEWCASTLE NSW 2300
1300 657 657
(02) 4979 9625 (F)
enquiries@hunterwater.com.au

5 June 2014

Our Ref: 2007-94/23/23.005

Flow Systems
Suite 201, Level 2
1 Alfred Street
SYDNEY NSW 2000

COORANBONG WATER - UTILITY SERVICES AGREEMENT
Letter of Support - Independent Pricing & Regulatory Tribunal Licence Application

Hunter Water is offering this letter of support to form part of the 'Cooranbong Water' licence application being made by Flow Systems to the Independent Pricing and Regulatory Tribunal under the Water Industry Competition Act (WICA). Hunter Water understands that Cooranbong Water will be a wholly owned subsidiary of Flow Systems. 'Cooranbong Water' is referred to from here on in this correspondence.

In this instance the predominant land developer in North Cooranbong is JPG, holding approximately 2,350 lots of the planned 2,500 lot potential in the release area. JPG has engaged Cooranbong Water to supply a range of water utility services to 'Watagan Park' estate, amongst other relatively minor nearby developments comprising the release area.

Hunter Water is continuing to negotiate with Cooranbong Water regarding the bulk supply of drinking water and an interim point of connection to sewer services. Progress has been made on a number of technical and commercial terms. An initial draft 'Utility Services Agreement' has been provided to Hunter Water for consideration, joint development and future negotiation.

While the technical and commercial terms are yet to be finalised, it is intended that Hunter Water and Cooranbong Water enter a 'Utility Services Agreement' that contemplates:

Bulk Water Supply:

1. Hunter Water supplying bulk drinking water to Cooranbong Water at North Cooranbong;
2. Augmentation of Hunter Water's water network is to be undertaken by the developer in accordance with the approved North Cooranbong Development Water Servicing Strategy (Version C, September 2013), as amended, and in consultation with Cooranbong Water;
3. The points of connection to Hunter Water's water network are shown diagrammatically in Appendix A.

Interim Sewer Servicing:

4. On a commercial basis Hunter Water is willing to consider an interim single sewer point of connection for Cooranbong Water in lieu of their commissioned local wastewater treatment facility. This is subject to reaching a satisfactory commercial arrangement that adequately addresses Hunter Water's operational and environmental risks in a range of operating scenarios including the potential delayed availability of the wastewater treatment plant or the treatment plant not being able to be established at all.
5. Cooranbong Water have advised that the local waste water treatment facility will be available by August 2016. Hunter Water requires that the interim sewer connection arrangement, therefore, must be abandoned by August 2016, or as soon as the treatment plant is available, whichever is the earlier;

6. The interim sewer servicing arrangement must be controlled to ensure that by accepting the interim sewer discharges, Hunter Water is able to remain compliant with its own regulatory and licencing obligations and maintain service standards to its existing customers;

7. Flow Systems have advised that up to a maximum of 156 lots may connect during the period to establish the local wastewater treatment plant generating a peak sewer discharge of 4.0L/sec from the pressure sewer network.

8. Hunter Water requires that the proposed pressure sewer network operated by Cooranbong Water be able to be remotely isolated from the Hunter Water sewer network during a number of abnormal operating events. The satisfactory operation of the interim sewer servicing arrangement relies on the provision of 24 hours emergency storage on each lot and the ability to cease discharge as required from time to time.

9. The interim sewer connection point will need to be setup to provide interoperability with Hunter Water downstream assets. Isolation during power outages, high well alarms or other as yet unspecified events will be required.

Discharge of excess untreated or treated effluent to Hunter Water

10. Cooranbong Water have indicated that from time to time the need may arise to discharge either excess treated wastewater or, in the event that their treatment plant is offline, discharge untreated sewerage to Hunter Water's network.

11. Depending on the circumstance presented at the time of the need arising, Hunter Water will work with Cooranbong Water to assist where possible. The operational status of Hunter Water infrastructure at the time of the request will influence the ability of Hunter Water in this regard. Direct discharge to the local network, road tankering of waste to Dora Creek WWTW, or to other downstream assets may be possible.

12. Each request will be considered on its merit giving consideration to the operational and environmental impacts that may ensue for both network operators.

13. Depending on the characteristics of the discharge requested, tariff costs may be incurred by Cooranbong Water.

14. Hunter Water is not able to offer a standing arrangement that can be called upon at will by Cooranbong Water to discharge excess treated or untreated sewerage.

Other matters

15. Cooranbong Water will be responsible for the provision of operation, maintenance and retail services to all customers upstream of the point of connection to the water and sewer network of Hunter Water.

16. Other interface requirements as needed.

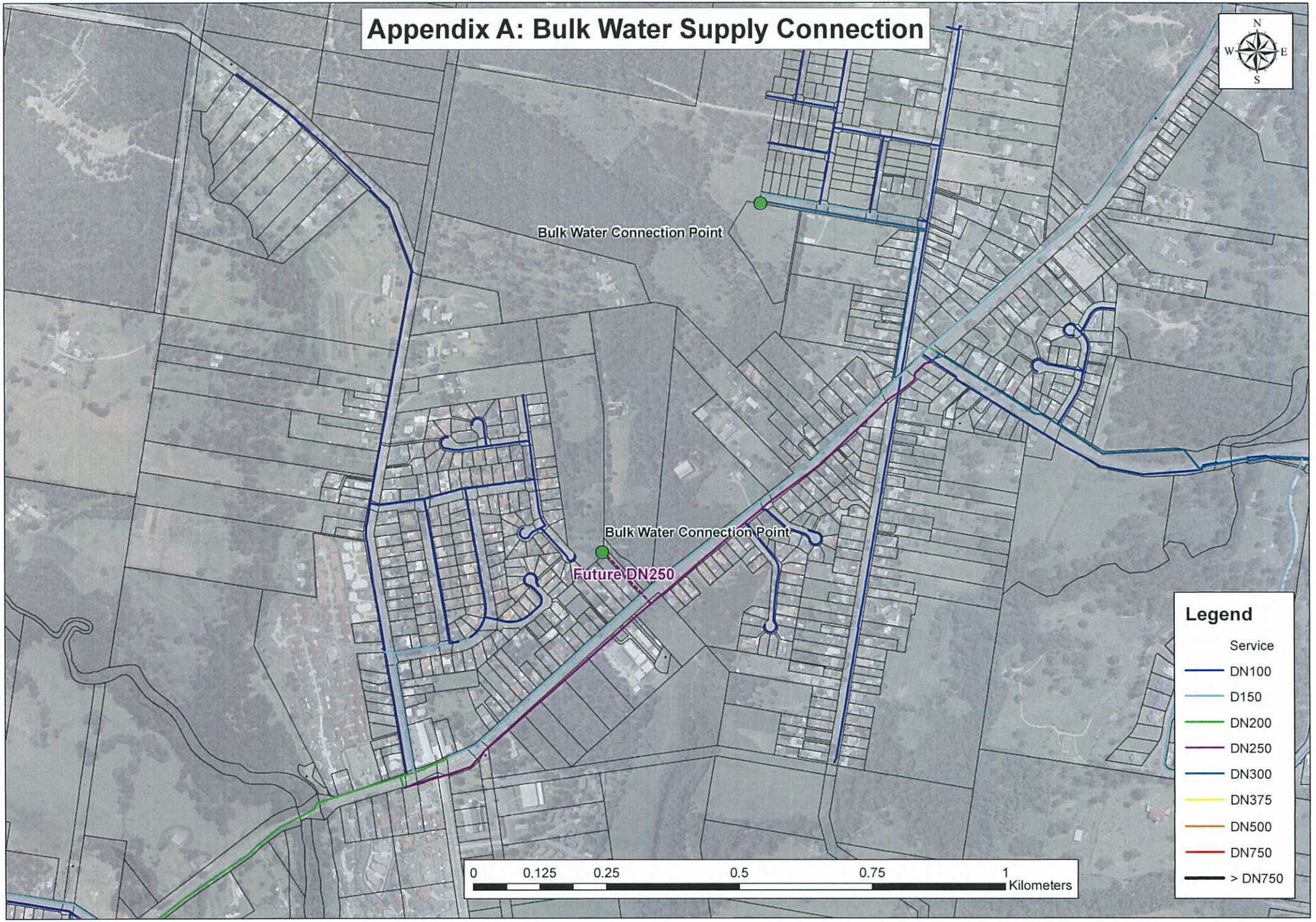
Hunter Water looks forward to establishing an ongoing commercial relationship with Cooranbong Water. Should you wish to discuss these matters further please contact me on (02) 4979-9495.

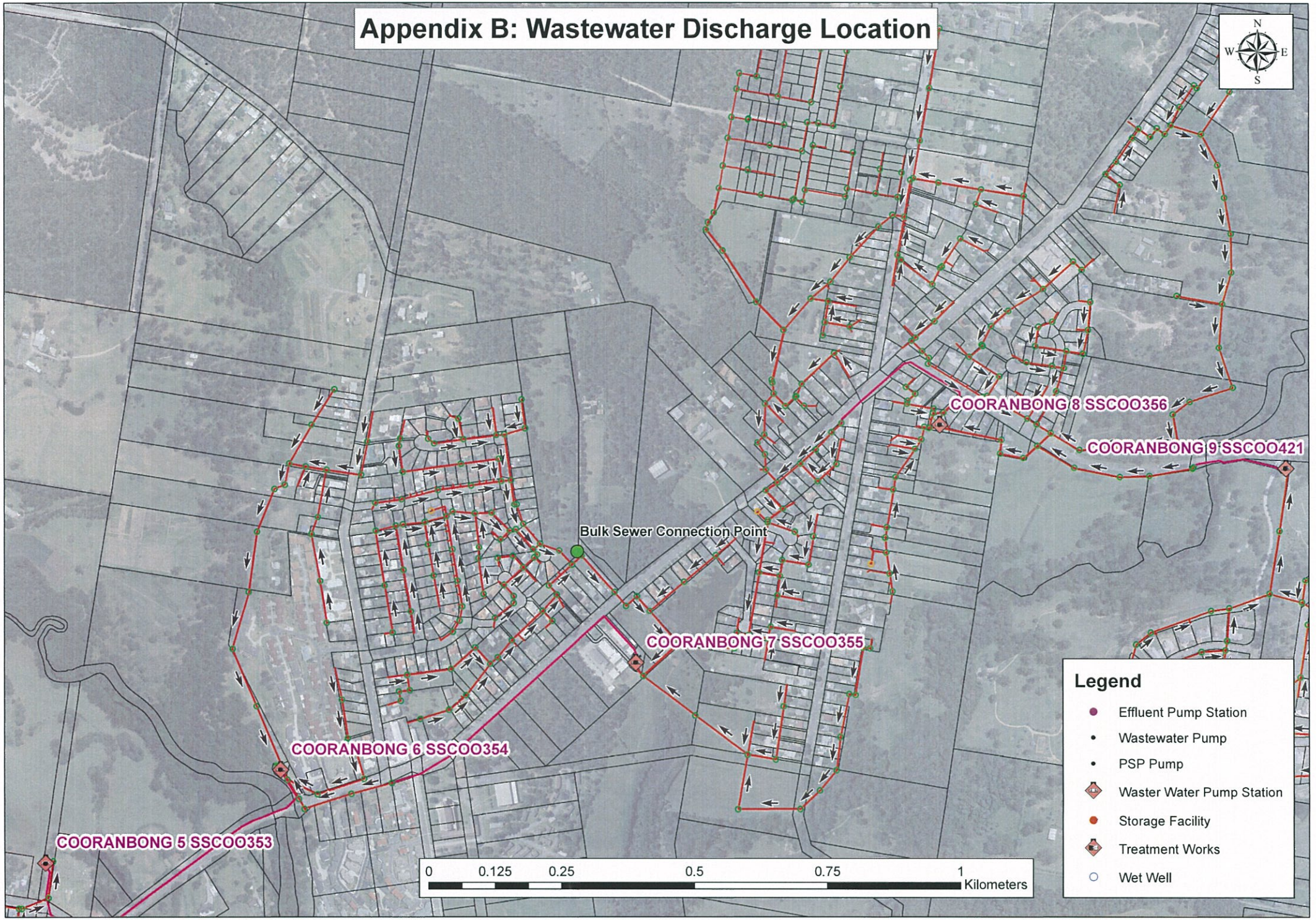
Yours faithfully

DEAN TAYLOR
Chief Customer Services Officer

Attached: **Appendix A – Water Connection Points**
Appendix B – Interim Sewer Connection Point

Appendix A: Bulk Water Supply Connection




Appendix B: Wastewater Discharge Location
N
W
E
S
COORANBONG 8 SSCOO356
COORANBONG 9 SSCOO421
Bulk Sewer Connection Point
COORANBONG 7 SSCOO355
COORANBONG 6 SSCOO354
COORANBONG 5 SSCOO353
0
0.125
0.25
0.5
0.75
1
Kilometers
Legend
Effluent Pump Station
Wastewater Pump
PSP Pump
Waster Water Pump Station
Storage Facility
Treatment Works
Wet Well

In reply please send to: Newcastle District Office

Our reference: FN10-24934L1

Your reference:

Contact: Richard Pickles (02) 4908 4352

ROB DWYER
RPS AUSTRALIA ASIA PACIFIC
PO BOX 428
HAMILTON NSW 2303

4 August 2014

Dear Sir

ENQUIRY NO: TENQ14-11713L1
LOT 12 DP 1158508 NO

This property is not within a proclaimed Mine Subsidence District and is not subject to any building restrictions imposed by the Mine Subsidence Board. The property also sits outside any current mining lease.

The provisions of the Mine Subsidence Compensation Act cover any improvement erected on this land.

Yours faithfully

R. Pickles

Richard Pickles
Acting District Manager

M 10 (Auto) Nov 2001

MINE SUBSIDENCE BOARD

ABN: 87 445 348 918

NEWCASTLE
Ground Floor
NSW Government Offices
117 Bull Street
Newcastle West 2302
PO Box 488G Newcastle 2300
Telephone: (02) 4908 4300
Facsimile: (02) 4929 1032
DX 4322 Newcastle West

PICTON
100 Argyle Street
Picton 2571
PO Box 40 Picton 2571
Telephone: (02) 4677 1967
Facsimile: (02) 4677 2040
DX 26053 Picton

SINGLETON
The Central Business Centre
Unit 6, 1 Pitt Street
Singleton 2330
PO Box 524 Singleton 2330
Telephone: (02) 6572 4344
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WYONG
Suite 3 Feldwin Court
30 Hely Street
Wyong 2259
PO Box 157 Wyong 2259
Telephone: (02) 4352 1646
Facsimile: (02) 4352 1757
DX 7317 Wyong

HEAD OFFICE
PO Box 488G
Newcastle 2300
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Appendix 4

Flora and Fauna Assessment Report

Flora and Fauna Assessment

Cooranbong Local Water Centre, Lot 12 DP 1158508 Freemans Drive, Cooranbong NSW

Prepared by:

RPS AUSTRALIA EAST PTY LTD

PO Box 428
Hamilton NSW 2303

T: +61 2 4940 4200
F: +61 2 4961 6794
E: newcastle@rpsgroup.com.au

Prepared for:

JOHNSON PROPERTY GROUP PTY LTD

PO Box A1308 Sydney South 1235
338 Kent Street
Sydney NSW 2000

Client Manager: Matt Doherty
Report Number: PR122894-1
Version / Date: Final/ August 2014

IMPORTANT NOTE

We have prepared this report for the sole purposes of Johnson Property Group Pty Ltd ("**Client**") for the specific purpose of only for which it is supplied ("**Purpose**"). This report is strictly limited to the purpose and the facts and matters stated in it and does not apply directly or indirectly and will not be used for any other application, purpose, use or matter.

In preparing this report we have made certain assumptions. We have assumed that all information and documents provided to us by the Client or as a result of a specific request or enquiry were complete, accurate and up-to-date. Where we have obtained information from a government register or database, we have assumed that the information is accurate. Where an assumption has been made, we have not made any independent investigations with respect to the matters the subject of that assumption. We are not aware of any reason why any of the assumptions are incorrect.

This report is presented without the assumption of a duty of care to any other person (other than the Client) ("**Third Party**"). The report may not contain sufficient information for the purposes of a Third Party or for other uses. Without the prior written consent of RPS Australia East Pty Ltd:

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(b) RPS Australia East Pty Ltd will not be liable to a Third Party for any loss, damage, liability or claim arising out of or incidental to a Third Party publishing, using or relying on the facts, content, opinions or subject matter contained in this report.

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In this note, a reference to loss and damage includes past and prospective economic loss, loss of profits, damage to property, injury to any person (including death) costs and expenses incurred in taking measures to prevent, mitigate or rectify any harm, loss of opportunity, legal costs, compensation, interest and any other direct, indirect, consequential or financial or other loss.

Document Status

Version	Purpose of Document	Orig	Review	Review Date
Draft	Draft for Client Review	LV	MD	12-8-2014
Final	Final for Submission	LV	MD	14-8-2014

Approval for Issue

Name	Signature	Date
Matt Doherty		14-8-2014

Contents

Tables

Figures

Plates

Appendices

Summary

RPS Australia East Pty Ltd (RPS) has been engaged by Johnson Property Group Pty Ltd to prepare a Flora and Fauna Assessment (FFA) as part of an Environmental Impact Statement (EIS) for the proposed Cooranbong Local Water Centre (LWC). Johnson Property Group is seeking approval for the construction of the LWC under Part 4 of the *Environmental Planning and Assessment Act 1979*. The proposed development is designated development pursuant to Schedule 3 Part 1 Section 29 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation).

The objective of this assessment was to provide a description of the terrestrial and aquatic habitats available on site for both flora and fauna, determine the likelihood of occurrence of threatened species and their habitats as well as assessing the likelihood of the Project to have a significant impact on any threatened species, populations or ecological communities listed within the *Threatened Species Conservation Act 1995* (TSC Act) and/or *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Recommendations with regard to minimisation and mitigation of impacts are provided for any ecologically significant values on site. The report recognises the relevant requirements of the *Environmental Planning and Assessment Act 1979* (EP&A Act) as amended by the *Environmental Planning and Assessment Amendment Act 1997* (EP&AA Act).

Database searches were undertaken to identify existing records of threatened species, populations and endangered ecological communities occurring within the site and the surrounding locality. Flora and fauna surveys were undertaken across the Site from August 2014.

Two threatened flora species, namely *Angophora inopina* (Charmhaven Apple) and *Grevillea parviflora* subsp. *parviflora* (Small-leaved Grevillea) were recorded within the Site during surveys. Both species are listed as Vulnerable under both the NSW TSC Act and Commonwealth EPBC Act.

MU 31 Coastal Plains Scribbly Gum Woodland was detected on the site

Fauna surveys across the overall Site resulted in the positive identification of two threatened fauna species, namely the Eastern Freetail Bat (*Mormopterus norfolkensis*) and the Little Bentwing Bat (*Miniopterus australis*). Both species are listed as Vulnerable under the NSW TSC Act.

The available fauna habitat within the Site is largely limited to areas of native vegetation. The trees on site offer foraging resources and potential small hollows for birds, gliders and possums. The understorey is dense in parts with Hakea and Banksia species, offering foraging species for a range of small birds and mammals. Ground debris in the form of logs, rocks and leaf litter varies throughout the vegetation on site however overall it is considered low in availability.

It was determined that 19 threatened fauna species and five flora species listed under the TSC Act and three threatened fauna species and five threatened flora listed under the EPBC Act may possibly occur on the site. Assessments of Significance regarding MNES and the TSC Act concluded that the Project was unlikely to significantly impact on any of these threatened species.

Assessment under SEPP 44 found that no 'Potential Koala Habitat' occurs within the Site and no further assessment under SEPP 44 was required.

Mitigation measures have been recommended where impacts cannot be avoided, and the implementation of these measures should reduce adverse impacts on ecological values of the site.

1.0 Introduction

RPS Australia East Pty Ltd (RPS) was engaged by Johnson Property Group Pty Ltd to prepare a Flora and Fauna Assessment as part of an Environmental Impact Statement (EIS) over land at Lot 12 DP 1158508 being 617 Freemans Drive, Cooranbong NSW (refer to **Figure 1**) . Johnson Property Group is seeking approval for the construction of the Cooranbong Local Water Centre (LWC) under Part 4of the *Environmental Planning and Assessment Act 1979*. The proposed development is designated development pursuant to Schedule 3 Part 1 Section 29 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation).

This assessment aims to examine the likelihood of the Project to have a significant effect on any threatened species, populations or ecological communities listed within the *Threatened Species Conservation Act 1995* (TSC Act). The report recognises the relevant requirements of the *Environmental Planning and Assessment Act 1979* (EP&A Act) as amended by the *Environmental Planning and Assessment Amendment Act 1997* (EP&AA Act). Assessment is also made with regard to those threatened entities listed federally under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

1.1 Terminology

The Site

The Site includes the impact area for the Cooranbong LWC and is situated on part of Lot 12 DP 1158508 (**Figure 2**) and is consequently subject to the assessments outlined within this report.

1.2 Site Particulars

Locality – Cooranbong, NSW

LGA – Lake Macquarie.

Area – The Site is 1.44 hectares in size.

Zoning – I10 Investigation

Boundaries – The Site is situated to the north of Freemans Drive in Cooranbong. Rural residential properties border the eastern, western and northern boundaries of the Site, containing areas of vegetation and cleared land.

Current Land Use – The Site currently supports areas of cleared land, native vegetation and areas of disturbed native vegetation.

Soils/Topography – The underlying geology of the Site is composed of the Narrabeen Group and Clifton Subgroup. The Munmorah Conglomerate Formations exists in the area and comprises sandstone, interbedded sandstone and siltstone, claystone with conglomerate and sandstone of the Widden Brook conglomerate.

The Site is located across two soil landscapes. The dominant being the Doyalson landscape over a majority of the area, and a small portion in the south east corner is covered by the Wyong landscape.

The Doyalson topsoil generally comprises up to 10 cm of brown loose loamy sand (do1) which overlies 10-30 cm of hardsetting bleached yellowish brown clayey sand (do2) on top of 30-60 cm of earthy bright yellowish

brown sandy clay loam (do3). The Do3 layer will occasionally overlie up to 50cm of a massive pale grey clay (do4). The presence of Do5 is at a subsoil level (B horizon) on fine-grained bedrock (Murphy 1993: 49-51).

The Wyong soils generally comprise 10-40 cm of brownish black pedal loam (wy1) that overlies >200 cm of a mottled brownish grey clay (wy2). Occasionally between the wy1 and wy2 layers a bleached greyish yellow brown to dull yellow orange sandy clay loam can occur (Murphy 1993: 81-83).

Hydrology- The Site is located approximately 200 metres west from a second order unnamed tributary of Dora Creek. The closest permanent water source to the Site is Jigadee Creek situated approximately 700 metres to the south east.

Vegetation – The vegetation on site consists of semi fragmented patches of eucalypt woodland (0.89 ha) with a portion of the Site existing as cleared lands (0.55 ha). A known history of logging and disturbance has resulted in a stand of relatively young canopy trees and lower species diversity in certain areas.

1.3 Description of the Project

The Proposal consists of buildings, plant and equipment that will utilise sewage from the future North Cooranbong Residential Precinct to produce high quality water. The sewage will be treated at the facility through a multi-stage process of screening, anaerobic and aerobic processing, chemical treatment, membrane filtration, ultraviolet disinfection and chlorination. The recycled water will be plumbed into houses for non-potable uses such as toilet flushing, washing machines, irrigation and car washing, thus reducing potable water demand. The recycled water will also be used on occasions for irrigation of areas of the JPG controlled land within the North Cooranbong Residential Precinct subject to separate negotiations and agreements between LMCC and JPG. Excess recycled water will be discharged to the existing Hunter Water Corporation (HWC) sewerage network under separate agreement if required.

The Proposal will provide an alternative to the traditional sewage treatment plant usually required to service new residential developments. The facility will also make a significant contribution to sustainability through the provision of recycled water back to the new residential areas. Prior to commissioning and operation of the facility an interim arrangement for sewage disposal will be in place. This will collect sewage from the pressure sewerage network and discharge it to the existing HWC sewerage network possibly via interim flow balance tanks.

The features of the Project are as follows:

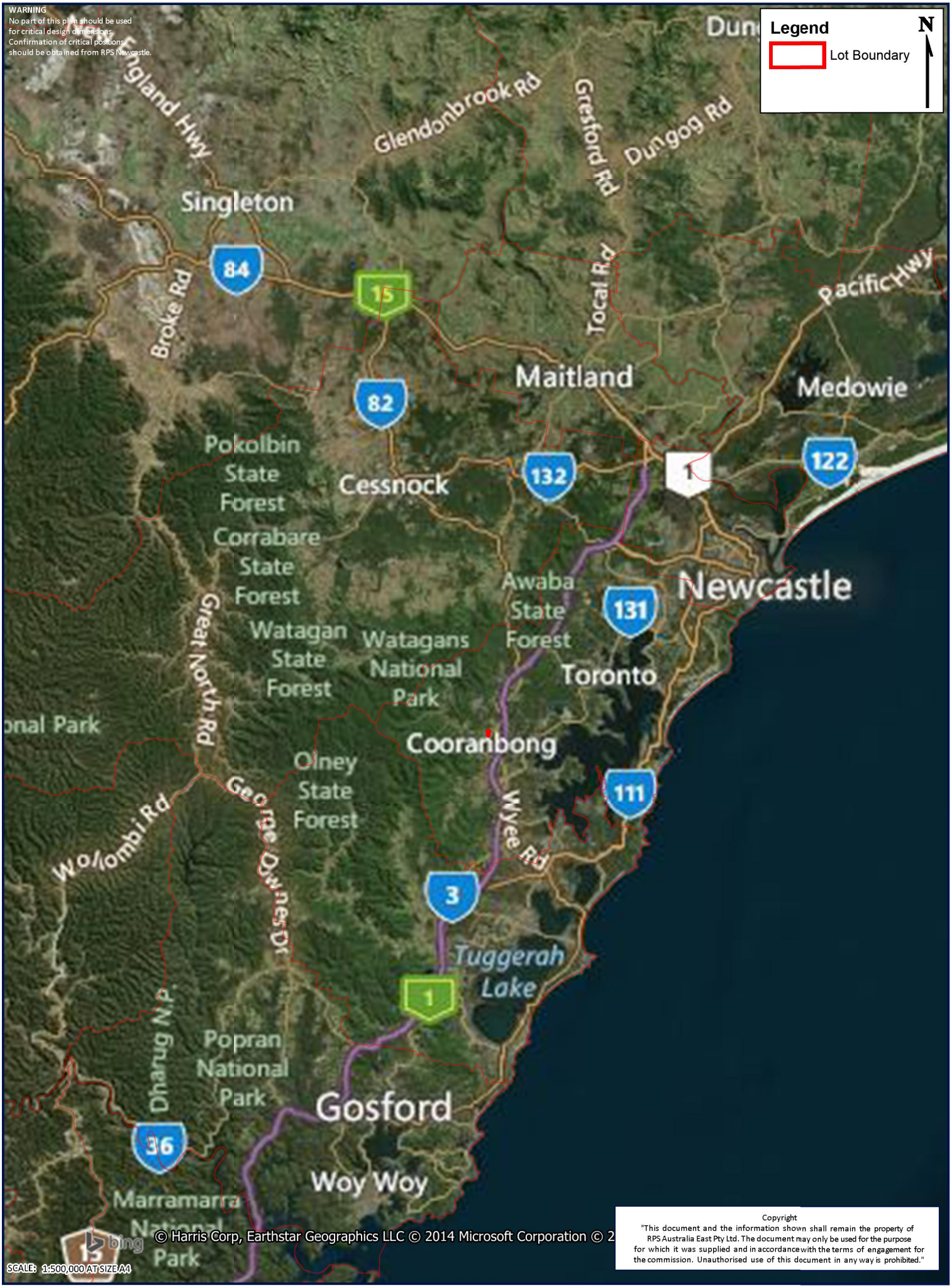
- The site will have permanent vehicle access from a future road created through the subdivision of Lot 12 DP 1158508. The road will connect directly to Freemans Drive at the location of a future signalised intersection;
- The site accommodates the main facility building within an enclosed structure which also includes equipment and instrumentation for operation of the treatment process;
- The facility building occupies an area of approximately 600m^2;
- The site has potential to accommodate tanks for storage of recycled water (2), drinking water (2), and for chlorine (1) and the like. These will be installed on a gradual basis as the development expands;
- Hardstand areas for vehicles are provided for delivery and maintenance purposes. A service driveway and concrete hardstand is located on the western side of the operations building that will link to the new road within the subdivision. Initially, access will be via an extension to the existing gravel driveway access which will be replaced at a later stage with a permanent road pavement access via the subdivision of Lot 12 DP 1158508;

- Appropriately positioned external lighting will be provided to the external areas of the building which is configured with movement sensors and light sensors to provide additional deterrent against vandalism and graffiti. CCTV monitoring of external areas will be provided for security;
- All buildings and facilities will be designed and constructed in accordance with *Building Code of Australia* (BCA) requirements;
- Areas for soft landscaping have been provided to complement the architecture of the facility building and surrounding residential area;
- Bushfire management on the site includes the choice of material used in construction; and
- Subdivision of the site from the parent lot – being Lot 12 DP 1158508.

The Proposal is a component of the larger North Cooranbong Residential Development (also referred to as 'Watagan Park') and will function to serve future residential developments constructed as a result of the proposal.

1.4 Scope of the Study

The scope of this flora and fauna assessment is to respond to the Secretary's Environmental Assessment Requirements (SEARs) issued under Section 78A (8) of the NSW Environmental Planning and Assessment Act (1979) for the proposal. The proposal is to be assessed as Designated Development under Part 4 of the EP&A Act (1979) by Lake Macquarie City Council (LMCC).



TITLE: FIGURE 1: SITE LOCATION	LOCATION: COORANBONG	DATUM: GDA 94 PROJECTION: MGA ZONE 56	DATE: 12/08/2014 PURPOSE: EIS	LAYOUT REF: VERSION (PLAN BY): JS (A A4)

CLIENT: JOHNSON PROPERTY GROUP
JOB REF: PR122894

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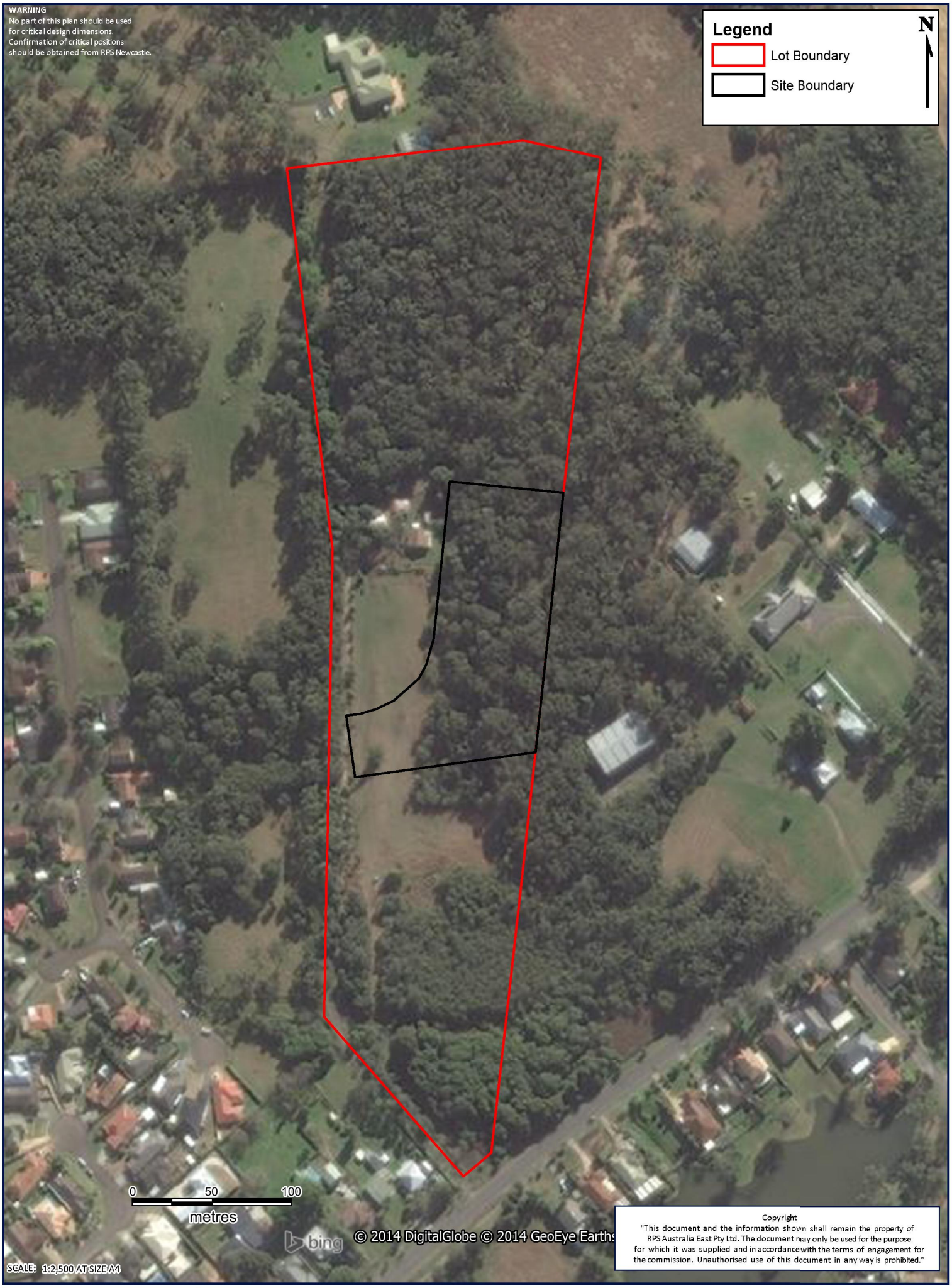

TITLE: FIGURE 2: LOT BOUNDARY AND SITE CONTEXT	LOCATION: COORANBONG	DATUM: GDA 94 PROJECTION: MGA ZONE 56	DATE: 12/08/2014 PURPOSE: EIS	LAYOUT REF: [illegible] VERSION (PLAN BY): JS (A A4)

CLIENT: JOHNSON PROPERTY GROUP
JOB REF: PR122894

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1.5 Secretary's Environmental Assessment Requirements

The SEARs were issued for the Project by the DP&I on 10 June 2014. OEH issued information requirements for the Project on 2 June 2014 and LMCC on 3 June 2014. **Table 1** below details the information requirements relevant to this assessment and where they have been addressed.

Table 1 Project SEARs relating to Biodiversity

Requirements	Addressed in this Report
Secretary's Environmental Assessment Requirements	
▪ Impacts on terrestrial, riparian and aquatic flora and fauna and habitat, and groundwater dependent ecosystems, within and surrounding the proposed development footprint, taking into account threatened species, ecological communities and critical habitat listed under the *Threatened Species Conservation Act 1995* and *Fisheries Management Act 1994,* including consideration of activities requiring approval or concurrence under the *Fisheries Management Act 1994*. ▪ Offset requirements must be considered as part of the assessment. ▪ The assessment must also take into any existing Species Impact Statement(s) relevant to the Project area;	Section 4
Secretary's Environmental Assessment Requirements – Policies, Guidelines and Plans	
The EIS must assess the Project against the relevant legislation, planning documents and environmental planning instruments, including, but not limited to:	
▪ State Environmental Planning Policy (Infrastructure) 2007;	Refer to Section 4.3.2 in EIS
▪ Lake Macquarie Local Environmental Plan 2000;	Refer to Section 4.3.6 in EIS
▪ Draft Lake Macquarie Local Environmental Plan 2014;	Refer to Section 4.3.7 in EIS
▪ Lake Macquarie Development Control Plan;	Refer to Section 4.3.8 in EIS
▪ Lake Macquarie Draft Development Control Plan 2014.	Refer to Section 4.3.9 in EIS
▪ Threatened Species Assessment Guidelines: The Assessment of Significance (DECC 2007);	Appendix 1
NSW OEH General Requirements	
The EIS should include a detailed biodiversity assessment, including assessment of impacts on threatened biodiversity, native vegetation and habitat.	
A field survey of the surrounding site should be conducted and documented in accordance with relevant guidelines including: ▪ The Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna – Amphibians (DECCW, 2009b) ▪ Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities –Working Draft (DEC 2004) and ▪ Threatened species survey and assessment guidelines information on www.environment.nsw.gov.au/threatenedspecies/surveyassessmentgdlns.htm.	Section 2 Note: As discussed in OEH cover letter the site will be assessed by LMCC as Designated Development. OEH has a further role should an SIS be required due to significant impact determination. As such the current LMCC Flora and Fauna Assessment Guidelines have been utilised to inform this assessment
The EIS should contain the following as a minimum: a) The requirements set out in the Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft (DEC 2004). b) Description and geo-referenced mapping of Site (and spatial data files), for example overlays on topographic maps, satellite images and/or aerial photos, including details of map datum, projection and zone, all survey locations, all vegetation communities (including classification and methodology used to classify), key habitat features and reported locations of threatened species, populations and ecological communities present in the Site. c) Description of survey methodologies used, including timing, location and	Section 2 Figure 2 Figure 3 Figure 4 Figure 5 Figure 6 Figure 7

Requirements	Addressed in this Report
weather conditions. d) Details, including qualifications and experience of all staff undertaking the surveys, mapping and assessment of impacts as part of the EIS. e) Detailed description of all vegetation communities (both forested and non-woody eg derived grasslands), including classification and methodology used to classify) and including all plot data. f) Identification of national and state listed threatened biota known or likely to occur in the Site and their conservation status. g) Description of the likely impacts of the Project on biodiversity and wildlife corridors, including direct and indirect and construction and operation impacts. Where possible, quantify these impacts such as the amount of vegetation community or species habitat to be cleared or impacted, or any fragmentation of a wildlife corridor. The Project should provide an assessment of the cumulative impacts of the Project in relation to other nearby developments. h) Identification of the avoidance, mitigation, offsetting/compensatory habitat and management measures that will be in place as part of the Project to avoid or minimise impacts, including details about alternative options considered and how long management arrangements with term be guaranteed. i) Description of the residual impacts of the Project. j) Provision of specific Statement of Commitments relating to biodiversity.	Section 2.2 Appendix 5 Section 3.2.2 Table 6 Section 4 Appendix 1 Section 7 Section 4 Refer to EIS
An assessment of the significance of direct and indirect impacts of the Project must be undertaken for threatened biodiversity known or likely to occur in the Site based on the presence of suitable habitat. This assessment must take into account: a) The factors identified in s.5A of the EP&A Act; and b) The guidance provided by *The Threatened Species Assessment Guideline – The Assessment of Significance* (DECC 2007).	Appendix 1
Offsets ▪ Where an offsets package is proposed by a proponent for impacts to biodiversity this package should: a) Meet either the requirements of the i) BioBanking Assessment Methodology (DECC 2008) utilising the (A) BioBanking Assessment Methodology and Credit Calculator Operational Manual (DECC 2009) and (B) Assessor's guide to using the BioBanking Credit Calculator v.2 (OEH 2012) or (ii) OEH's *Principles for the use of biodiversity offsets in NSW*. b) Identify the conservation mechanisms to be used to ensure the long term protection and management of the offset sites. c) Include an appropriate Management Plan (such as vegetation or habitat) that has been developed as a key amelioration measure to ensure any proposed compensatory offsets, retained habitat enhancement features within the development footprint and/or impact mitigation measures (including proposed rehabilitation and/or monitoring programs) are appropriately managed and funded. ▪ Where appropriate, likely impacts (both direct and indirect) on any adjoining and/or nearby National Parks and Wildlife Service estate reserved under the NPW Act or any marine and estuarine protected areas under the *Fisheries Management Act 1994* or the *Marine Parks Act 1997* should be considered. ▪ With regard to the *Commonwealth Environment and Protection and Biodiversity Conservation Act 1999*, the assessment should identify any relevant Matters of National Environmental Significance and whether the Project has been referred to the Commonwealth or already determined to be a controlled action.	No offsets proposed – no further response in the Ecological Assessment or over arching EIS.

1.6 Licensing

Research was conducted under the following licences:

- NSW National Parks and Wildlife Service Scientific Investigation Licence SL100536 (Valid 31 December 2014).

- Animal Research Authority (Trim File No: 14/195) issued by NSW Agriculture (Valid 12 March 2015).
- Animal Care and Ethics Committee Certificate of Approval (Trim File No: 14/195) issued by NSW Agriculture (Valid 18 March 2016).
- Certificate of Accreditation of a Corporation as an Animal Research Establishment (Trim File No: 14/532 & Ref No: AW2001/014) issued by NSW Agriculture (Valid 22 May 2017).

1.7 Certification

As the principal author, I, Matt Doherty, make the following certification:

- The results presented in the report are, in the opinion of the principal author and certifier, a true and accurate account of the species detected, or considered likely to occur;
- Commonwealth, state and local government policies and guidelines formed the basis of the Projects surveying methodology, or where the survey work has been undertaken with specified departures from industry standard guidelines, details of which are discussed and justified in **Section 3**; and
- All research workers have complied with relevant laws and codes relating to the conduct of flora and fauna research, including the *Animal Research Act 1995*, *National Parks and Wildlife Act 1974* and Australian Code of Practice for the Care and Use of Animals for Scientific Purposes.

Signature of Principal Author and Certifier:

Matt Doherty, Technical Director

RPS
August 2014

2.0 Methodology

The SEARs outlined OEH policy and documentation that should be considered during the preparation of this ecological assessment to inform the EIS. As discussed in OEH cover letter the site will be assessed by LMCC as Designated Development. OEH has a further role should an SIS be required due to significant impact determination. On this basis, the LMCC Flora and Fauna Assessment Guidelines (V 4.2) (LMCC 2012) underpin the ecological survey and assessment prepared herewith.

2.1 Desktop Assessment

2.1.1 Literature Review

A review of relevant information was undertaken to provide an understanding of ecological values occurring or potentially occurring on the Site and locality (i.e. within 10km of the Site). Reports prepared for the Site and nearby sites have been reviewed for the purpose of assessing the likelihood of threatened species or ecological communities occurring within the Site. Information sources reviewed included:

- Review of fauna and flora records contained in the Office of Environment and Heritage (OEH) Atlas of NSW Wildlife (BioNet) within a 10 km radius of the Site;
- Review of fauna and flora records contained in the Department of Sustainability, Environment, Water, Population and Communities (SEWPAC) Protected Matters Search within a 10 km radius of the Site;
- OEH Threatened Species, Populations and Ecological Communities website (*http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/*);
- Clements, A., Gorrod, E., Rodd, J., Rodd, T. and Wilkins, Sian. (2004) *Flora Assessment: North Cooranbong*. Anne Clements & Associates, North Sydney;
- Smith, A. and Murray. M. (2005) *Cooranbong Aerodrome: Fauna Constraints Assessment*. Austeco, Armidale.
- Harper Somers O'Sullivan (2007) *Flora and Fauna Assessment for a Proposed Rezoning to facilitate a Recreation Facility at Cooranbong Town Common.* Broadmeadow, NSW; and
- Clements, A., Baumann, A. Clarke, D. and Snowdon, R. (2013) *Rehabilitation and Maintenance Plan for the 'Watagan Park' (North Cooranbong Development)*. Anne Clements & Associates Pty Ltd, North Sydney.*
  (*Note that this Plan made reference to numerous reports pertaining to the vegetation mapping across the approved North Cooranbong Residential Development which have inadvertently been considered for this report).

2.1.2 Weather Conditions

The survey methods used and the prevailing weather conditions at the time of survey are presented in **Table 2**. Weather data were obtained from Bureau of Meteorology (BoM) data from the nearest weather station at Cooranbong (station 061412).

Table 2 Prevailing Weather Conditions*

Date	Minimum Temperature (°C)	Maximum Temperature (°C)	Rain (mm)	Sunrise-Sunset	Moon Rise-Moon Set
5 May 2014	8.6	19.4	0	06:30-17:12	11:18-22:11
6 May 2014	3.8	21.6	0	06:31-17:11	11:57-23:04
7 May 2014	9.0	20.3	0	06:32-17:10	12:33-23:57
8 May 2014	9.4	19.8	0	06:33-17:09	13:07-NA
9 May 2014	11.2	21.4	2.2	06:34-17:08	13:40-00:51
2 June 2014	10.9	22.1	4.0	06:49-16:55	09:55-20:55
3 June 2014	5.7	20.0	0	06:50-16:55	10:32-21:48
4 June 2014	5.5	21.0	0	06:50-16:55	11:07-22:41
5 June 2014	13.6	19.2	3.4	06:51-16:54	11:40-23:34
6 June 2014	14.1	16.9	8.8	06:51-16:54	12:12-NA
10 June 2014	8.1	19.3	7.4	06:53-16:54	14:36-03:20
11 June 2014	7.5	19.7	4.6	06:54-16:54	15:22-04:22

*Sources: http://www.bom.gov.au/climate/dwo/IDCJDW2159.latest.shtml
http://www.ga.gov.au/bin/geodesy/run/gazmap_sunrise?placename=cooranbong&placetype=0&state=0
http://www.ga.gov.au/bin/geodesy/run/gazmap_moonrise?placename=Cooranbong&placetype=0&state=0#loc

2.2 Flora Survey

2.2.1 Vegetation Mapping

Desktop analysis of regional mapping of the Site and its surrounds was informed by large-scale vegetation mapping projects and aerial photography, including:

- Preliminary consultation of the Lower Hunter & Central Coast Regional Environmental Management Strategy (LHCCREMS) Extant Vegetation of the Lower Hunter and Central Coast Map (NPWS 2003) to determine the broad categorisation of the Site;
- Preliminary consultation with Vegetation Mapping of Lake Macquarie LGA: Stages 1-3 and 5 (Bell and Driscoll 2013);
- Aerial Photograph Interpretation (API) and consultation of topographic map (Scale1:25000) of the Site; and
- Consideration of literature review outcomes

Vegetation communities were delineated on site based on the above-mentioned desktop information coupled with vegetation quadrats and vegetation transects (outlined below) to assist in refining the vegetation community delineation over the Site.

2.2.2 Vegetation Quadrats and Transects

A total of two 20 x 20 m floristic quadrats were undertaken throughout the Site. Quadrats are designed to assess the species type and abundance within the vegetation community. All recorded flora were identified to species where possible, however some were identified to genus level only. Quadrats were used to refine the vegetation community delineation.

Additionally, three transects were conducted over the Site to achieve a higher coverage of present flora species.

The location of all flora surveys is shown in **Figure 3**.

2.2.3 Significant Flora Survey

Threatened flora species were identified via the “Random Meander Technique” described by Cropper (1993) which was performed across the Site during the survey period. If a species could not be verified on site, a sample was collected and identified at a later date and confirmed. Searches for threatened flora species were also undertaken opportunistically during traverses throughout the Site during other survey periods and methodologies.

The locations of any threatened flora species that were found within the Site were recorded by the use of Trimble differential GPS units with sub-metre accuracy. A full compilation of flora species recorded during the quadrats and Random Meander Transects is provided as **Appendix 2**.

The locations of the flora survey methods are shown in **Figure 3**.

TITLE: FIGURE 3: FLORA SURVEY LOCATIONS

LOCATION: COORANBONG

DATUM: GDA 94

PROJECTION: MGA ZONE 56

DATE: 12/08/2014

PURPOSE: EIS

LAYOUT REF:

VERSION (PLAN BY): JS (B A4)

CLIENT: JOHNSON PROPERTY GROUP

JOB REF: PR122894

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2.3 Fauna Survey

A desktop assessment of the potential use of the Site by threatened fauna species (as listed under the TSC Act and EPBC Act) identified from the vicinity was undertaken prior to the commencement of field surveys.

The presence of fauna within the Site was determined through a variety of survey techniques including Elliot traps, spotlighting, call playback, harp trapping, Anabat recordings and opportunistic sightings. These methodologies are described in further detail below.

The survey effort for the fauna survey techniques employed has been undertaken in accordance with the LMCC Flora and Fauna Survey Guidelines (2012). The locations of fauna surveys have been chosen based on the requirements of the two stratification unit established from previous vegetation mapping. Fauna survey locations are shown in **Figure 4**.

2.3.1 Avifauna

The observation of avifauna within the Site was undertaken via targeted diurnal and opportunistic census during other diurnal fieldwork, including works scheduled for peak activity periods i.e. dawn and dusk. Incidental recordings were supplemented by targeted searches for avifauna, predominantly at each of the standard survey sites (due to survey timing) as well as other areas throughout the Site. Emphasis was placed on areas that display high bird activity or had favourable habitat conditions (such as undisturbed areas, flowering trees and species specific habitats). Other features, such as evidence of breeding, dominant species etc. were also noted. Threatened species that have been previously recorded in the locality were specifically targeted during such surveys. One census plot was undertaken.

Nocturnal surveys (see **sections 2.3.6** and **2.3.7**) were undertaken to detect nocturnal bird species within the Site.

2.3.2 Arboreal Mammal Trapping

Arboreal trapping was undertaken using tree mounted Elliott B size traps. Traps were mounted on brackets set at approximately 2 m in height on trees with a Diameter at Breast Height (DBH) greater than 30 cm. Traps were baited with a rolled oats, peanut butter and honey mixture and the tree trunks were sprayed liberally with a brown sugar and water mix each day in the late afternoon. Traps were checked early each morning. Arboreal traps targeted arboreal mammals such as the threatened Squirrel Glider (*Petaurus norfolcensis*) which has been previously recorded from the surrounding area.

A total of one trapping transect, containing 10 Elliott B size arboreal traps were installed. Trapping was undertaken over four nights, resulting in 40 arboreal trap nights within the Site. The location of the trap line is shown in **Figure 4**.

2.3.3 Terrestrial Mammal Trapping

Terrestrial trapping was undertaken using Elliott A and Elliott B. Elliott traps were baited with a mixture of rolled oats, peanut butter and honey. Traps were checked within 2 hours of sunrise each morning, with any captures identified and released at point of capture. Traps were re-baited where necessary. The selected locations of the trap lines focused on stratification units as well as areas consisting of understorey that would provide protection for terrestrial mammal species. The location of the trap line is shown in **Figure 4**.

Terrestrial traps targeted small terrestrial mammals such as dasyurids (eg. Antechinus and Dunnarts), and rodents (e.g. rats and mice). A total of one trapping transect was undertaken within the Site containing 25 Elliot A and three Elliot B traps per line. This resulted in 100 Elliott A trap nights and 12 Elliott B trap nights within the Site.

2.3.4 Herpetofauna

Opportunistic reptile searches were conducted during fauna surveys with a focus on suitable habitat areas. Known occurrences of threatened reptile species from the region were taken into account during assessment of onsite habitat, to determine the potential for the Site to support such species.

Searches in likely habitat such as among thick leaf litter, under rocks and fallen timber were undertaken. These searches were carried out during peak activity periods, generally during the warmer parts of the day. Dumped rubbish was also checked for sheltering reptiles.

2.3.5 Micro-Chiropteran Bats

Microbat echolocation calls were recorded using Anabat II Detector and CF ZCAIM units set to remotely record for the entire night (6pm to 6am). The Site had four consecutive nights of sampling using one Anabat unit, with emphasis placed on those areas deemed likely to provide potential foraging and flyway sites for microbats. The location of the Anabat site is shown in **Figure 4**.

Bat call analysis was undertaken by Anna McConville of Echo Ecology who is experienced in the analysis of bat echolocation calls. Each call sequence ('pass') was assigned to one of three categories, according to the confidence with which an identification could be made, being:

- Definite - Pass identified to species level and could not be confused with another species;
- Probable - Pass identified to species level and there is a low chance of confusion with another species; or
- Possible - Pass identified to species level but short duration or poor quality of the pass increases the chance of confusion with another species.

Harp Traps were also utilised near the trap line location on the Site. Harp Traps are designed to catch microbats, allowing for visual identification of species occurring on the Site. Any microbats caught were identified early the following morning and kept in a small cloth bag which was kept in a cool dark environment until they could be released at nightfall at the site of capture. One harp traps was used during surveys, over four consecutive nights, totalling four harp trap nights.

Appendix 4 shows the Anabat report with all results whilst **Figure 4** shows the Harp Trap location.

2.3.6 Spotlighting

Spotlighting was undertaken with the use of a 75-Watt hand-held spotlight and head torch whilst driving and walking over the Site. Areas of dense bush were targeted, however tracks were also spotlighted whilst entering and exiting the Site. Cleared/disturbed areas of land may have been used to traverse whilst spotlighting into the adjacent vegetation.

A total of one person hours of spotlighting was conducted over two nights.

Figure 4 displays the spotlighting survey effort across the Site.

2.3.7 Nocturnal Call Playback

Pre-recorded calls of Owl, Koala and Glider species with the potential to occur within the Site were broadcast during the surveys in an effort to elicit vocal responses or to attract the species to the playback site. The calls were broadcast through an amplification system (loud hailer) designed to project the sound for at least 1 km under still night conditions.

As described by Kavanagh and Peake (1993) and Debus (1995), the call of each species was broadcast for at least five minutes, followed by five minutes of listening, and stationary spotlighting. Following the final broadcast and listening, the area was spotlighted on foot. Species targeted included the Barking Owl (*Ninox connivens*), Powerful Owl (*N. strenua*), Masked Owl (*Tyto novaehollandiae*), Sooty Owl (*T. tenebricosa*) and Koala (*Phascolarctos cinereus*).

A total of two call playback sessions were undertaken within the Site. The location of the call playback sites are shown in **Figure 4**.

2.3.8 Infrared Cameras

One remote sensor infrared cameras was used on the Site to detect nocturnal and diurnal fauna. Areas of higher quality vegetation were selected for camera placement to target species such as the threatened Squirrel Glider (*Petaurus norfolcensis*). The camera was tied to a tree at approximately 1.5 m from the ground and angled towards the ground. Cat food was used as bait and placed within the cameras centre focal point on the ground to attract fauna. Bait was replaced every day to enhance the smell of the bait for higher probability of fauna visitation.

A total of 4 camera trap nights were undertaken over the survey period. The location of the camera is shown in **Figure 4**.

2.3.9 Secondary Indications and Incidental Observations

Opportunistic sightings of secondary indications (scratches, scats, diggings, tracks etc.) of resident fauna were noted. Such indicators included:

- Distinctive scats left by mammals;
- Scratch marks made by various types of arboreal animals;
- Nests made by various guilds of birds;
- Feeding scars on Eucalyptus trees made by Gliders;
- Whitewash, regurgitation pellets and prey remains from Owls;
- Aural recognition of bird and frog calls;
- Skeletal material of vertebrate fauna; and
- Searches for indirect evidence of fauna (such as scats, nests, burrows, hollows, tracks, and diggings).

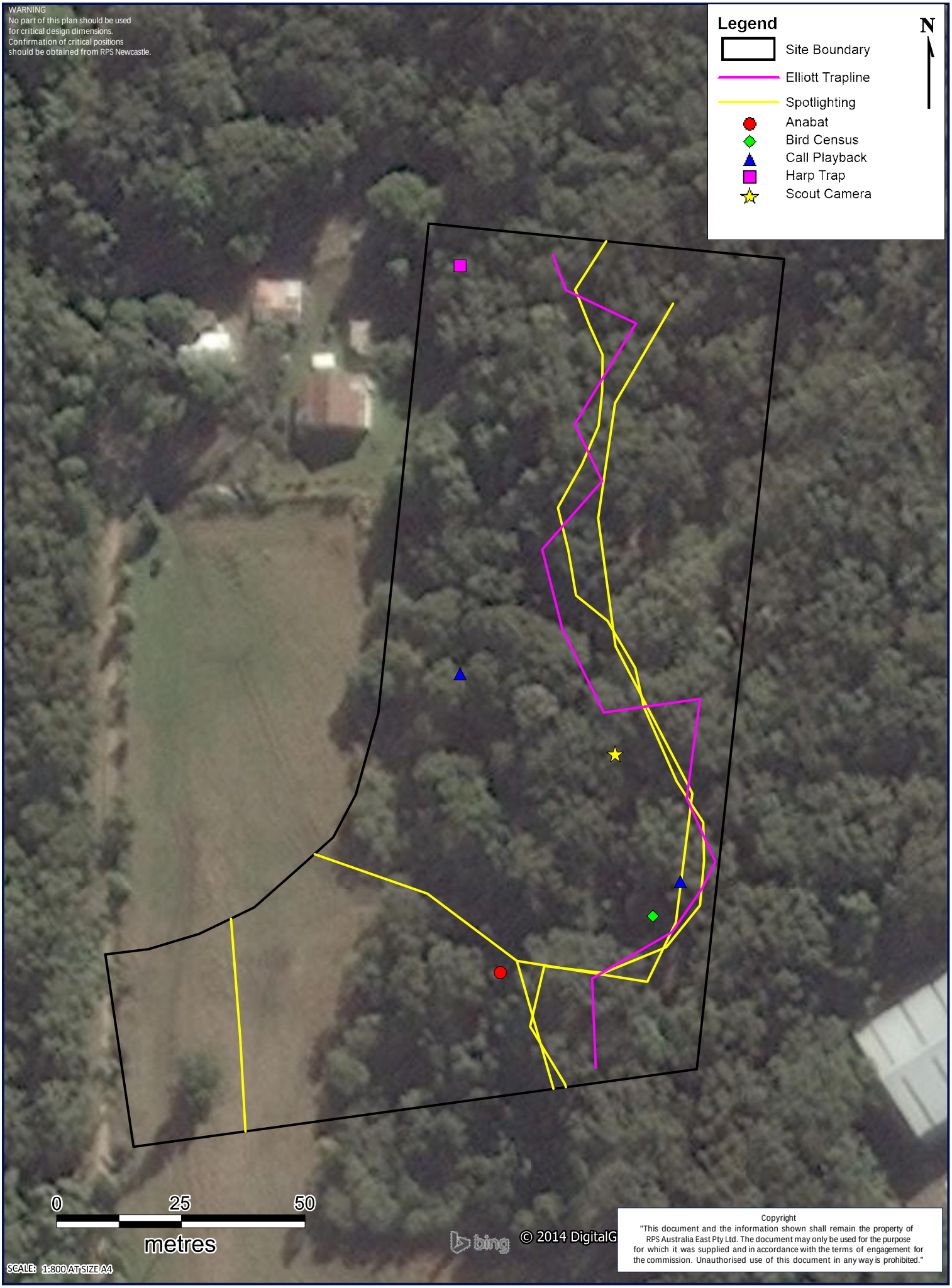
2.4 Habitat Survey

An assessment of the relative habitat value present within the Site was undertaken. This assessment focused primarily on the identification of specific habitat types and resources in the Site favoured by known threatened species from the region. The assessment also considered the potential value of the Site (and surrounds) for all major guilds of native flora and fauna. Habitat assessment included:

- presence, size and types of tree hollows;
- presence of rocks, logs, caves, rocky outcrops, leaf litter, overhangs and crevices;
- vegetation complexity, structure and quality;
- presence of freshwater or estuarine aquatic habitats, noting permanency;
- connectivity to adjacent areas of habitat;
- extent and types of disturbance;

- presence of foraging opportunities such as flowering eucalypts, fruits, seeds or other nectar bearing native plants; and
- presence and abundance of various potential prey species.

Habitat assessment was based on the specific habitat requirements of each threatened fauna species in regards to home range, feeding, roosting, breeding, movement patterns and corridor requirements. Consideration was given to contributing factors including topography, soil, light and hydrology for threatened flora and assemblages.



TITLE: FIGURE 4: FAUNA SURVEY LOCATIONS

LOCATION: COORANBONG

DATUM: GDA 94
PROJECTION: MGA ZONE 56

DATE: 12/08/2014
PURPOSE: EIS

LAYOUT REF:
VERSION (PLAN BY): JS (B A4)

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2.5 Survey Effort and Limitations

2.5.1 Survey Effort

The level of survey effort was considered in line with the Lake Macquarie Flora and Fauna Survey Guidelines V4.2 (2012). These guidelines use a concept of 'stratification units' in order to recommended the amount of flora and fauna survey effort to be undertaken over a given area.

In order to appropriately identify each vegetation community within the Site, flora survey effort was undertaken in accordance with LMCC (2012), with each individual vegetation community representing a separate stratification unit. **Table 3** represents the survey effort for flora quadrats and transects undertaken in relation to LMCC (2012) survey guidelines, with the areas per stratification unit evaluated against the results of this report (see **Section 3.2.1**). In addition, targeted surveys occured throughout the Site on several occasions. Targeted flora surveys were in excess of reccomended survey effort.

Table 3 Flora Survey Effort of the Site

Vegetation Map Unit	MU 31 (3.4 ha)	Total
Suggested Quadrat	1	1
Undertaken	2	2
Suggested Transect	1-2	1-2
Undertaken	4	4

The Site contains similar vegetation types throughout its extent, dominated by dry sclerophyll woodlands and forests with a small area of riparian vegetation. In consideration of survey effort for fauna, the Site has been stratified using the LMCC (2012) system of vegetation classification as undertaken with flora surveys. **Table 4** provides a breakdown of the survey effort undertaken in relation to the suggested survey effort (LMCC 2012), per stratification unit.

The statification of the vegetation units for fauna surveys is as follows:

- Coastal Plains Scribbly Gum Woodland (MU31) (including disturbed areas of this community).

Although the cleared areas were not targeted for survey effort, the spotlighitng survey fell within these areas. Opportunistic searches for reptiles, amphibians, birds and mammals which were undertaken during all other survey efforts have not been included in the table.

Table 4 Fauna Survey Effort of the Site

Target Species	Method	Value	Coastal Plains Scribbly Gum Woodland (3.4 ha)		Total	
			Suggested	Undertaken	Suggested	Undertaken
Small mammals	Terrestrial A	Trap Nights	100	100	100	100
Medium sized mammals	Terrestrial B		48	12 (supplemented by motion camera)	48	12
Arboreal mammals	Arboreal B		30	40	30	40
	Motion detection Camera		Optional	4	-	4

Target Species	Method	Value	Coastal Plains Scribbly Gum Woodland (3.4 ha)		Total	
Bats	Harp trap		4	4	4	4
	Ultrasonic detection		4	4	4	4
Various nocturnal mammals and birds	Spotlighting on foot (based on GPS records taken)	Hours	2x30 min 1km/hour <100ha	1	1	1
	Call Playback (birds)	Sites	2	2	2	2
	Call Playback (Mammals)	Incorporate within Owl CPB				
Diurnal birds	20 min census	Sites	1	1	1	1
Reptiles	Targeted Habitat Search		Required only in September to April	1	-	1
Amphibians	Targeted Habitat Search		Required only in September to April	1	-	1

The survey effort, for those survey methods employed for the Project, has met or exceeded the recommended survey efforts as per LMCC (2012). The methods used are appropriate for targeting and detecting the variety of common and threatened flora and fauna species known or have potential to occur within the Site.

2.5.2 Limitations

Limitations associated with this Ecological Assessment Report are presented herewith. The limitations have been taken into account specifically in relation to threatened species assessments, results and conclusions.

In these instances, a precautionary approach has been adopted; as such 'assumed presence' of known and expected threatened species, populations and ecological communities has been made where relevant and scientifically justified to ensure a holistic assessment.

2.5.3 Seasonality

Threatened flora species should be surveyed within their respective flowering periods to ensure accurate identification. The flowering and fruiting plant species that attract some nomadic or migratory threatened species, often fruit or flower in cycles spanning a number of years. Furthermore, these resources might only be accessed in some areas during years when resources more accessible to threatened species fail. As a consequence, threatened species may be absent from some areas where potential habitat exists for extended periods and this might be the case for the above-mentioned opportunistic species. This limitation has been reduced to some extent by the large amount of survey work that has been undertaken throughout the local area, as well as local knowledge of species occurrence.

2.5.4 Data Availability & Accuracy

The collated threatened flora and fauna species records provided by the Wildlife Atlas are known to vary in accuracy and reliability. Traditionally this is due to the reliability of information provided to the NPWS for

collation and/or the need to protect specific threatened species locations. For the purposes of this assessment this information has been considered to have a maximum accuracy of ± 1 km.

Threatened flora and fauna records within the region were predominantly sourced from the online OEH Bionet and SEWPAC Protected Matters Search Tool. Limitations exist with regards to this data and its accuracy.

Location data recorded by RPS during the survey period has been undertaken with a Differential Trimble GeoXH GPS unit, which is capable of sub-metre accuracy following post processing.

3.0 Results

3.1 Desktop Assessment

3.1.1 Existing Report Results

Results from previous reports detected numerous threatened flora, fauna and/or Ecological Communities in the near vicinity to the Site. **Table 5** below highlights these results.

Table 5 Previous reports threatened species results

Scientific Name	Common name	TSC Act Status	EPBC Act Status	Notes and Source
Flora				
Angophora inopina	Charmhaven Apple	V	V	Recorded in close proximity to the Site[2]
Grevillea parviflora subsp. *parviflora*	Small-leaved Grevillea	V	V	Recorded in close proximity to the Site[2]
Melaleuca biconvexa	Biconvex Paperbark	V	-	Recorded in close proximity to the Site[1]
Tetratheca juncea	Black-eyed Susan	V	V	Recorded in close proximity to the Site[2]
Mammals				
Calyptorhynchus lathami	Glossy-Black Cockatoo	V	-	Recorded in close proximity to the Site[3]
Miniopterus australis	Little Bentwing-Bat	V	-	Recorded in close proximity to the Site[3]
Miniopterus schreibersii oceanensis	Eastern Bentwing-Bat	V	-	Recorded in close proximity to the Site[13]
Mormopterus norfolkensis	East-coast Freetail-bat	V	-	Recorded in close proximity to the Site[13]
Myotis macropus	Southern Myotis	V	-	Recorded in close proximity to the Site[3]
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Recorded in close proximity to the Site[3]
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	-	Recorded in close proximity to the Site[1]
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	Recorded in close proximity to the Site[3]
Ecological Communities				
Freshwater Wetland Complex; commensurate with Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	-	E	-	Recorded in close proximity to the Site[1]
Swamp Sclerophyll Forest on Coastal Floodplain of the NSW North Coast, Sydney Basin and South East Corner bioregions.	-	E	-	Recorded in close proximity to the Site[2]

Note: V= Vulnerable E= Endangered

(1) Harper Somers O'Sullivan (2007) Flora and Fauna Assessment for a Proposed Rezoning to facilitate a

Recreation Facility at Cooranbong Town Common. Broadmeadow, NSW.

(2) Clements, A., Gorrod, E., Rodd, J., Rodd, T. and Wilkins, Sian. (2004) *Flora Assessment: North Cooranbong*. Anne Clements & Associates, North Sydney.

(3) Smith, A. and Murray. M. (2005) *Cooranbong Aerodrome: Fauna Constraints Assessment*. Austeco, Armidale.

3.1.2 Database Searches

Using the NSW Wildlife Atlas database BioNet, and EPBC Act Protected Matters Search (8 August 2014), a list of potentially occurring threatened species from the locality (10 km radius) has been compiled (**Table 6**), which includes threatened flora and fauna species (Endangered or Vulnerable) and populations listed under the TSC Act or EPBC Act. A total of 16 threatened flora species and 54 threatened fauna species have either been detected or have the potential to occur within the locality (**Table 6**). Included in **Table 6** below are the numbers of records for each species taken from the NSW Wildlife Atlas database. The EPBC Act Protected Matters Search does not provide number of records within the search radius. Therefore, for the record count related only to those TSC Act listed species that were detected within 10km of the Site. It is also noted that due to the terrestrial nature of the site, marine and aquatic species were not considered under this ecological assessment.

Table 6 Threatened Flora and Fauna Desktop Search Results

Scientific Name	Common Name	TSC Act	EPBC Act	No. of Records	Notes and Source
Flora					
Acacia bynoeana	Bynoe's Wattle	E	V	61	Recorded within 10km of the Site[1] Species or species habitat likely within area[2]
Angophora inopina	Charmhaven Apple	V	V	388	Recorded within 10km of the Site[1] Species or species habitat may occur within area[2]
Asterolasia elegans	-	E	E	0	Species or species habitat likely to occur within area[2]
Cryptostylis hunteriana	Leafless Tongue-orchid	E	V	6	Recorded within 10km of the Site[1] Species or species habitat may occur within area[2]
Eucalyptus parramattensis subsp. *parramattensis*	-	E	-	4	Recorded within 10km of the site[1]
Grevillea parviflora subsp. *parviflora*	Small-flower Grevillea	V	V	39	Recorded within 10km of the Site[1] Species or species habitat likely to occur within area[2]
Maundia triglochinoides	-	V	-	7	Recorded within 10km of the site[1]

Scientific Name	Common Name	TSC Act	EPBC Act	No. of Records	Notes and Source
Melaleuca biconvexa	Biconvex Paperbark	V	V	198	Recorded within 10km of the Site[1] Species or species habitat may occur within area[2]
Pelargonium sp. Striatellum (G.W.Carr 10345)	Omeo Storks-bill	E	E	0	Species or species habitat likely to occur within area[2]
Persicaria elatior	Tall Knotweed	V	-	1	Recorded within 10km of the Site[1]
Pterostylis gibbosa	Illawarra Greenhood	E	E	0	Species or species habitat may occur within area[2]
Rhizanthella slateri	Eastern Underground Orchid	V	E	0	Species or species habitat may occur within area[2]
Rutidosis heterogama	Heath Wrinklewort	V	V	2	Recorded within 10km of the Site[1]
Streblus pendulinus	Siah's Backbone	-	E	0	Species or species habitat may occur within area[2]
Syzygium paniculatum	Magenta Lilly Pilly	E	V	2	Recorded within 10km of the Site[1] Species or species habitat known to occur within area[2]
Tetratheca juncea	Black-eyed Susan	V	V	563	Recorded within 10km of the Site[1] Species or species habitat known to occur within area[2]
Amphibians					
Crinia tinnula	Wallum Froglet	V	-	13	Recorded within 10km of the Site[1]
Heleioporus australiacus	Giant Burrowing Frog	V	V	2	Recorded within 10km of the Site[1] Species or species habitat likely to occur within area[2]
Litoria aurea	Green and Golden Bell Frog	E	V	0	Species or species habitat likely to occur within area[2]
Litoria littlejohni	Littlejohns Tree Frog	V	V	12	Recorded within 10km of the Site[1] Species or species habitat may occur within area[2]
Mixophyes balbus	Stuttering Frog	E	V	83	Recorded within 10km of the Site[1] Species or species habitat likely to occur within area[2]

Scientific Name	Common Name	TSC Act	EPBC Act	No. of Records	Notes and Source
Mixophyes iteratus	Giant Barred Frog	E	E	2	Recorded within 10km of the Site[1] Species or species habitat likely to occur within area[2]
Pseudophryne australis	Red-crowned Toadlet	V	-	27	Recorded within 10km of the Site[1]
Reptiles					
Hoplocephalus bungaroides	Broad-headed Snake	E	E	0	Species or species habitat known to occur within area[2]
Hoplocephalus stephensii	Stephens Banded Snake	V	-	5	Recorded within 10km of the Site[1]
Birds					
Anthochaera phrygia	Regent Honeyeater	CE	E	23	Recorded within 10km of the Site[1] Species or species habitat likely to occur within area[2]
Botaurus poiciloptilus	Australasian Bittern	E	E	0	Species or species habitat known occur within area[2]
Burhinus grallarius	Bush Stone-curlew	E	-	1	Recorded within 10km of the Site[1]
Calidris ferruginea	Curlew Sandpiper	E	M	1	Recorded within 10km of the Site[1] Species or species habitat known occur within area[2]
Callocephalon fimbriatum	Gang-gang Cockatoo	V	-	31	Recorded within 10km of the Site[1]
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	-	84	Recorded within 10km of the Site[1]
Chthonicola sagittata	Speckled Warbler	V	-	1	Recorded within 10km of the Site[1]
Climacteris picumnus victoriae	Brown Treecreeper (eastern subsp.)	V	-	2	Recorded within 10km of the Site[1]
Daphoenositta chrysoptera	Varied Sittella	V	-	16	Recorded within 10km of the Site[1]
Dasyornis brachypterus	Eastern Bristlebird	E	E	0	Species or species habitat likely to occur within area[2]
Ephippiorhynchus asiaticus	Black-necked Stork	E	-	16	Recorded within 10km of the Site[1]
Epthianura albifrons	White-fronted Chat	V	-	1	Recorded within 10km of the Site[1]
Erythrotriorchis radiatus	Red Goshawk	E	V	1	Species or species habitat likely to occur within area[2]
Glossopsitta pusilla	Little Lorikeet	V	-	31	Recorded within 10km of the Site[1]

Scientific Name	Common Name	TSC Act	EPBC Act	No. of Records	Notes and Source
Haematopus fuliginosus	Sooty Oystercatcher	V		1	Recorded within 10km of the Site[1]
Hieraaetus morphnoides	Little Eagle	V	-	3	Recorded within 10km of the Site[1]
Ixobrychus flavicollis	Black Bittern	V	E	2	Recorded within 10km of the Site[1]
Lathamus discolor	Swift Parrot	E	E	18	Recorded within 10km of the Site[1] Species or species habitat likely to occur within area[2]
Lophoictinia isura	Square-tailed Kite	V	-	2	Recorded within 10km of the site[1]
Neophema pulchella	Turquoise Parrot	V	-	4	Recorded within 10km of the Site[1]
Ninox strenua	Powerful Owl	V	-	37	Recorded within 10km of the Site[1]
Oxyura australis	Blue-billed Duck	V	-	1	Recorded within 10km of the Site[1]
Pandion cristatus	Eastern Osprey	V	M	8	Recorded within 10km of the Site[1]
Petroica boodang	Scarlet Robin	V	-	1	Recorded within 10km of the Site[1]
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V	-	1	Recorded within 10km of the Site[1]
Ptilinopus regina	Rose-crowned Fruit-Dove	V	-	1	Recorded within 10km of the Site[1]
Ptilinopus superbus	Superb Fruit-Dove	V	-	1	Recorded within 10km of the Site[1]
Rostratula australis	Australian Painted Snipe	E	E	0	Species or species habitat likely to occur within Site[1]
Stagonopleura guttata	Diamond Firetail	V	-	1	Recorded within 10km of the Site[1]
Stictonetta naevosa	Freckled Duck	V	-	1	Recorded within 10km of the Site[1]
Tyto novaehollandiae	Masked Owl	V	-	33	Recorded within 10km of the Site[1]
Tyto tenebricosa	Sooty Owl	V	-	32	Recorded within 10km of the Site[1]
Mammals					
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	1	Recorded within 10km of the Site[1] Species or species habitat may occur within area[2]
Dasyurus maculatus maculatus	Spotted-tailed Quoll (SE Mainland Pop)	V	E	15	Recorded within 10km of the Site[1] Species or species habitat may occur within area[2]

Scientific Name	Common Name	TSC Act	EPBC Act	No. of Records	Notes and Source
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-	4	Recorded within 10km of the Site[1]
Kerivoula papuensis	Golden-tipped Bat	V	-	8	Recorded within 10km of the Site[1]
Macropus parma	Parma Wallaby	V	-	3	Recorded within 10km of the Site[1]
Miniopterus australis	Little Bentwing-bat	V	-	24	Recorded within 10km of the Site[1]
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	-	23	Recorded within 10km of the Site[1]
Mormopterus norfolkensis	Eastern Freetail-bat	V	-	31	Recorded within 10km of the Site[1]
Myotis macropus	Southern Myotis	V	-	16	Recorded within 10km of the Site[1]
Petaurus australis	Yellow-bellied Glider	V	-	232	Recorded within 10km of the Site[1]
Petaurus norfolcensis	Squirrel Glider	V	-	88	Recorded within 10km of the Site[1]
Petrogale penicillata	Brush-tailed Rock-wallaby	E	V	4	Recorded within 10km of the Site[1] Species or species habitat known to occur within area[2]
Phascogale tapoatafa	Brush-tailed Phascogale	V	-	2	Recorded within 10km of the Site[1] Species or species habitat known to occur within area[2]
Phascolarctos cinereus	Koala (Qld, NSW, Vic and ACT Populations)	V	V	5	Recorded within 10km of the Site[1] Species or species habitat known to occur within area[2]
Potorous tridactylus tridactylus	Long-nosed Potoroo	V	V	4	Recorded within 10km of the Site[1] Species or species habitat may occur within area[2]
Pseudomys novaehollandiae	New Holland Mouse	-	V	3	Recorded within 10km of the Site[1] Species or species habitat known to occur within area[2]
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	76	Recorded within 10km of the Site[1] Roosting known to occur within area[2]
Saccolaimus flaviventris	Yellow-bellied Sheathtail Bat	V	-	3	Recorded within 10km of the Site[1]

Scientific Name	Common Name	TSC Act	EPBC Act	No. of Records	Notes and Source
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	23	Recorded within 10km of the Site[1]
Vespadelus troughtoni	Eastern Cave Bat	V	-	1	Recorded within 10km of the Site[1]

Key:

V Vulnerable Species

E Endangered Species

CE Critically Endangered

M Migratory

1 - OEH (2012) *Atlas of NSW Wildlife*, Office of Environment and Heritage (Accessed August 2014).

2 - SEWPAC (2012) Protected Matters Search, Department of Sustainability, Environment, Water, Population and Communities (Accessed August 2014).

Migratory species listed under the EPBC Act have also been considered under this assessment. Note that migratory marine species were not included in the assessment. **Table 7** displays these potentially occurring migratory species.

Table 7 Potentially occurring Migratory Species

Scientific Name	Common Name	EPBC Act Status
Ardea alba	Great Egret	M
Ardea ibis	Cattle Egret	M
Haliaeetus leucogaster	White-bellied Sea Eagle	M
Hirundapus caudacutus	White-throated Needletail	M
Merops ornatus	Rainbow Bee-eater	M
Monarcha melanopsis	Black-faced Monarch	M
Monarcha trivirgatus	Spectacled Monarch	M
Numenius madagascariensis	Eastern Curlew	M
Pluvialis fulva	Pacific Golden Plover	M
Rhipidura rufifrons	Rufous Fantail	M
Rostratula benghalensis	Painted Snipe	M

3.1.2.2 Potential Groundwater Dependent Ecosystems

The definitions for Groundwater Dependent Ecosystems (GDEs) have been adopted based on the following three literature sources:

- The NSW State Groundwater Dependent Ecosystems Policy (DLWC, 2002) defines GDEs as: '*Ecosystems which have their species composition and their natural ecological process determined by groundwater'* (ARNCANZ & ANZECC, 1996 as cited in DLWC, 2002).
- Identifying groundwater dependent ecosystems, A guide for land and water managers (Eamus, 2009) defines GDEs as: *'ecosystems whose current composition, structure and function are reliant on a supply of groundwater'*
- Risk assessment guidelines for groundwater dependent ecosystems (Serov *et. al.,* 2012) defines GDEs

as: '*any ecosystem that uses groundwater at any time or for any duration in order to maintain its composition and condition*'.

As defined by Eamus (2009) GDEs are; 'ecosystems whose current composition, structure and function are reliant on a supply of groundwater. This reliance might be expressed every day of the year, or only for a few months every few years, but the reliance becomes apparent when the supply of groundwater is removed for a sufficient length of time that changes in plant function (typically rates of water use decline first) are observable'.

Based on the definitions above, one vegetation community has been identified as having potential to occur within 'shallow aquifer zones' however this community is not positioned within the Site. This community is MU 42 Red Mahogany – Apple Paperbark Forest.

3.2 Flora Survey

Flora surveys detected a total of 71 flora species across the Site, including two threatened species, and two vegetation communities, of which one is commensurate with a TSC Act listed ecological community as outlined in detail below.

3.2.1 Regional Vegetation Community Mapping

A review of regional mapping - 'Vegetation Mapping of Lake Macquarie LGA: Stages 1-3, 5' (Bell and Driscoll 2013) identified one vegetation community within the Site, namely;

- MU 31 Coastal Plains Scribbly Gum Woodland;

3.2.2 Vegetation Community Delineation

The following vegetation communities were delineated on the Site during flora surveys:

- MU 31 Coastal Plains Scribbly Gum Woodland;
- Cleared/disturbed Land.

Table 8 outlines the areas of each community within the Site with Section 3.2.3 providing a detailed description of each vegetation community. Refer to **Figure 5** showing vegetation community descriptions.

Table 8 Vegetation Community Areas in Site

Vegetation Community	Area on Site
MU 31 Coastal Plains Scribbly Gum Woodland	Intact: 0.73 Disturbed: 0.16
Cleared/disturbed lands	0.55

3.2.3 Vegetation Community Profiles

The following section provides a brief outline of the dominant floral characteristics of each vegetation community identified within the Site.

MU 31 Coastal Plains Scribbly-gum Woodland

Plate 1 Map Unit 31 – Coastal Plains Scribbly Gum Woodland

Classification: MU 31 was commensurate with the LMCC vegetation mapping (Bell and Driscoll 2013).This vegetation community does not correspond with any EEC listed under the NSW TSC Act and/or EPBC Act.

Description: This vegetation community occurs on the broad crests and flats that dominate the coastal plain. Typically occurs on acidic and infertile soils. It varies from woodland to open woodland rarely exceeding 15m in height. It often merges with MU 30. MU 31 is displayed in **Plate 1**. A small portion (approximately 0.16 ha) of disturbed MU 31 also persists on site. Varying levels of weed incursion were observed throughout this community and have been mapped in **Figure 7**.

Area: 0.89 hectares (including disturbed areas of this community).

Canopy Layer To 18 metres with 60% Projected Foliage Cover (PFC) Dominant species included: *Eucalyptus capitellata* (Brown Stringybark) and *Corymbia gummifera* (Red Bloodwood).

Sub-canopy Layer: To 10 metres with 30% PFC. Dominant species include *Allocasuarina littoralis* (Black She-oak).

Shrub Layer: To 3 metres with 80% PFC. Dominant species include *Lambertia formosa* (Mountain Devil). Other species included *Leptospermum polygalifolium subsp. polygalifolium* (Tantoon), *Persoonia levis* (Broad-leaved Geebung) and *Acacia implexa* (Hickory Wattle).

Ground Layer To 0.6 metre with 100% PFC. Dominant species included grass and forbes such as *Entolasia stricta* (Wiry Panic), *Imperata cylindrica* (Blady Grass) and *Lomandra obliqua* (Twisted Mat-rush). Climbing species such as *Parsonsia straminea* (Common Silkpod Vine) were also recorded in this community.

Cleared/disturbed Land

Plate 2 Cleared/Disturbed Land (No MU)

All areas classified as Cleared/Disturbed Lands are areas where the native tree and shrub cover has been mostly removed, or where areas of dense weeds were present. These areas retain less than three percent canopy cover i.e. widely spaced isolated trees. Areas of Cleared/Disturbed Lands do not include areas of regrowth native vegetation (see **Plate 2**). Dominant species in the vegetated disturbed areas include *Ligustrum sinense* (Small-leaved Privet), *Ligustrum lucidum* (Large-leaved Privet), *Andropogon virginicus* (Whiskey Grass) and *Bidens pilosa* (Cobblers Pegs). The total area of cleared/disturbed lands is 0.55 ha within the Site.

3.2.4 Significant Flora

Two threatened flora species were detected within the Site during targeted threatened species surveys or in the course of other vegetation mapping activities, as listed below:

- *Angophora inopina* (Charmhaven Apple) (listed as Vulnerable under the TSC Act and EPBC Act); and
- *Grevillea parviflora* subsp. *parviflora* (Small-leaved Grevillea) (listed as Vulnerable under the TSC Act EPBC Act).

Angophora inopina (Charmhaven Apple)

A. inopina is a small to large sized woodland tree reaching heights of around 8 m. In NSW it is endemic to the Central Coast region with a disjunct population occurring at Karuah. It is typically found on deep, white, sandy loam-clay soils on sandstone with substrates that are low in nutrients and periodically inundated. Frequent in dry sclerophylla woodland of Scribbly Gum and Red Bloodwood with some Brown Stringybark and a dense understory.

A total of 22 individual *A. inopina* trees were recorded within the Site, in MU 31 Coastal Plains Scribbly Gum Woodland.

Grevillea parviflora subsp. *parviflora* (Small-leaved Grevillea)

G. parviflora subsp. *parviflora* is a small spindly shrub that can vary from low growing to a semi erect shape, to usually 1.5-2m high. It is endemic to NSW and occurs sporadically throughout the Sydney basin. It occurs on ridge crests, upper slopes or flat plains in both low-lying and higher topography areas. It has been known to occur in exposed disturbed areas such as roads and dirt tracks.

A single individual *G. parviflora* subsp. *parviflora* was recorded within the Site. *G. parviflora* subsp. *parviflora* was encountered within the disturbed portion of MU 31 Coastal Plains Scribbly Gum Woodland.

All threatened flora locations on site detected during surveys are displayed in **Figure 6**.

TITLE: FIGURE 5: VEGETATION COMMUNITIES MAP	LOCATION: COORANBONG	DATUM: GDA 94 PROJECTION: MGA ZONE 56	DATE: 12/08/2014 PURPOSE: EIS	LAYOUT REF: [illegible] VERSION (PLAN BY): JS (B A4)

CLIENT: JOHNSON PROPERTY GROUP
JOB REF: PR122894

RPS AUSTRALIA EAST PTY LTD (ABN 44 140 292 762)
241 DENISON STREET BROADMEADOW PO BOX 428 HAMILTON NSW 2303
T: 02 4940 4200 F: 02 4961 6794 www.rpsgroup.com.au

RPS

TITLE: FIGURE 6: THREATENED FLORA SPECIES ON SITE	LOCATION: COORANBONG	DATUM: GDA 94 PROJECTION: MGA ZONE 56	DATE: 12/08/2014 PURPOSE: EIS	LAYOUT REF: VERSION (PLAN BY): JS (C A4)

CLIENT: JOHNSON PROPERTY GROUP
JOB REF: PR122894

RPS AUSTRALIA EAST PTY LTD (ABN 44 140 292 762)
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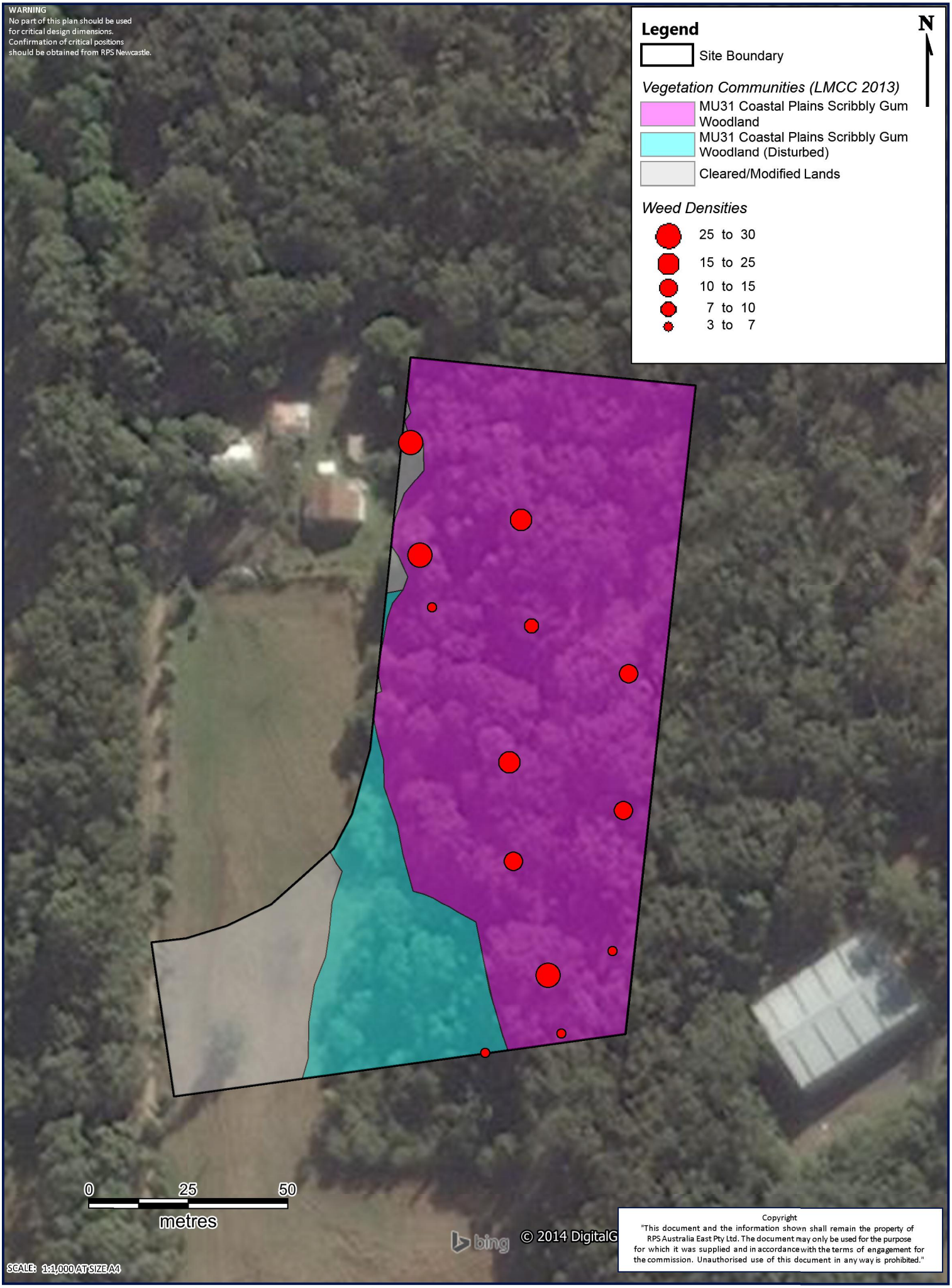

TITLE:	FIGURE 7: WEED DENSITY MAP	LOCATION:	COORANBONG	DATUM:	GDA 94	DATE:	13/8/2014
				PROJECTION:	MGA ZONE 56	PURPOSE:	EIS

LAYOUT REF: [illegible]
VERSION (PLAN BY): JS (B A4)

CLIENT: JOHNSON PROPERTY GROUP
JOB REF: PR122894

RPS AUSTRALIA EAST PTY LTD (ABN 44 140 292 762)
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3.3 Fauna Survey

The following sections provide the results of the fauna surveys undertaken for the Proposal throughout the Site. Survey techniques employed to determine the composition of fauna species on site resulted in a total of 37 species being detected including 27 bird and 10 mammal species. No reptile or amphibian species were detected during the survey period. A full list of the fauna species recorded within the Site is provided in **Appendix 3**. The results for each group are discussed further below. Two threatened fauna species listed under the TSC Act were detected during RPS surveys, being:

- Eastern Freetail Bat (*Mormopterus norfolkensis*) (Listed as Vulnerable under the TSC Act); and
- Little Bent-wing Bat (*Miniopterus australis*) (Listed as Vulnerable under the TSC Act).

3.3.1 Avifauna

A total of 27 bird species were recorded during field surveys. Bird species identified predominantly consisted of common woodland species such as the Red Wattlebird (*Anthochaera carunculata*), Australian magpie (*Cracticus tibicen*) and Lewin's Honeyeater (*Meliphaga lewinii*).

No threatened bird species were recorded on the Site.

An inventory of fauna species recorded on the Site is provided in **Appendix 3**.

3.3.2 Arboreal Mammal Trapping

One fauna species were caught in arboreal traps during the trapping period. This was the Brown Antechinus (*Antechinus stuartii*).

3.3.3 Terrestrial Mammal Trapping

Three species of mammal were caught in terrestrial Elliot traps during the trapping period, namely Brown Antechinus (*Antechinus stuartii*), Bush Rat (*Rattus fuscipes*) and the Black Rat (*Rattus rattus*). Brown Antechinus is a common dasyurid that dwells in dense shrub vegetation with suitable logs with hollows. The Bush Rat is a native species that occupies an extensive range of habitats including woodlands and forests such as those that persist on site.

A full list of mammal species recorded on site is in **Appendix 3**.

3.3.4 Herpetofauna

No amphibians or reptile species were detected on site during surveys.

3.3.5 Micro-Chiropteran Bats

A total of five microbat species were detected via the use of Anabat echo-location call recorders while a further one species was caught using harp traps. Of these species, two are listed as Vulnerable under the TSC Act, specifically the Little Bent-wing Bat (*Miniopterus australis*) and Eastern Freetail Bat (*Mormopterus norfolkensis*). Gould's Long-eared Bat (*Nyctophilus gouldi*), a common species, was the single species caught in the harp trap.

Additionally, the following microbat species had potential to occur within the Site, but could not be confidently identified during ultrasonic bat call analysis:

- Eastern Bentwing Bat (*Miniopterus schreibersii oceanensis*) (Vulnerable under the TSC Act);
- Large-footed Myotis (*Myotis macropus*) (Vulnerable under the TSC Act);

- Lesser Long-eared bat (*Nyctophilus geoffroyi*);
- Gould's Long-earedBat (*Nyctophilus gouldi*);
- Large Forest Bat (*Vespadelus darlingtoni*);
- Eastern Forest Bat (*Vespadelus pumilus*); and
- Southern Forest Bat (*Vespadelus regulus*).

Refer to **Appendix 3** for a detailed list of recorded species and **Appendix 4** for the Anabat Call Recording report.

3.3.6 Spotlighting

One species, namely the Common Brushtail Possum (*Trichosurus vulpecula*) was detected during spotlighting events on site.

3.3.7 Nocturnal Call Playback

No species responded to call playback during surveys.

3.3.8 Infrared Camera

Two fauna species were detected on images taken by the infrared camera, namely the Common Brushtail Possum (*Trichosurus vulpecula*) (refer to **Plate 3**) and the Red-necked Wallaby (*Macropus rufogriseus*).

Plate 3 Infrared Camera Image of Common Brushtail Possum

3.4 Habitat Survey

Although surveys were conducted throughout the overall Site, for the purpose of the habitat assessment the habitats available within the Site are discussed below.

3.4.1 Terrestrial Habitats

The Coastal Plains Scribbly Gum Forest (MU 31) provides suitable habitat for a number of small terrestrial mammals, especially where the understorys are most dense, as evidenced by the results of the fauna survey. Despite expectations of a potential abundance of introduced mammals (*Rattus* spp. *Mus.* sp. etc.) due to the disturbed nature of some of the site, the terrestrial mammals detected were predominantly native. The extensive areas of predominantly cleared land throughout the cleared/disturbed land assemblage also provide suitable foraging habitat for several species of macropods and predatory birds. Some small logs were present within the vegetated areas however, due to the young age of the vegetation stands these were scarce. Woodland habitats provide potential habitat for few threatened flora species including *Tetratheca juncea* and *Grevillea parviflora* subsp. *parviflora*.

3.4.2 Arboreal Habitats

The Open Forest areas contain potential foraging resources such as foliage, pollen, nectar and invertebrates for birds, possums and gliders. Particular flowering eucalypts on site offer nectar for a range of threatened bird species including the Little Lorikeet. The supply of nectar attracts insect populations, which provide foraging opportunities for a range of microbat species that occur within the locality. Although no obvious hollows were detected, given the abundance of sugar gliders on site and the presence of microbats some of which rely on tree hollows for roosting, it is assumed that some small hollows may be present. Predatory Owl species, such as the Masked Owl and Powerful Owl may utilise both arboreal and terrestrial habitats on site for foraging, as the Site contains an abundance of suitable prey species.

3.4.3 Riparian habitats

No riparian habitats occur on the Site.

3.4.4 Fauna Habitat Connectivity

The Site is situated within an urbanised area with vegetation fragments subsequently occurring frequently around the Site Boundaries. Connectivity to the south of the site is primarily discontinued by Freemans Drive which then proceeds with residential dwellings and minimal vegetation.

The Site connects vegetation to the south and north with smaller patches to the east and west on private lands. Connectivity continues further north where larger expanses of vegetation exist, however the approved North Cooranbong Residential Development will remove a large portion of this vegetation for mixed use developments. Notably, 119.24 ha of conservation lands are being designated within the North Cooranbong Residential Development. These areas will help to retain connectivity from the north of the Site through to the east and further north, as well as to the southwest.

Habitat connectivity will remain relatively consistent with the current availability post development within the Site.

3.5 State Environmental Planning Policy No. 44 (Koala Habitat Protection)

Assessment of potential koala habitat under SEPP 44 requires the following steps be undertaken:

(a) Identification of ‘potential Koala habitat’ within the proposed development area; if the total tree cover contains 15% or more of the Koala food tree species listed in Schedule 2 of SEPP 44 then it is deemed to be ‘potential Koala habitat’. Identification of ‘potential Koala habitat requires the determination of the presence of ‘core Koala habitat’;

(b) Identification of ‘core Koala habitat’ within the development area. ‘Core Koala habitat’ is defined as an area of land with a resident population of Koalas, evidenced by attributes such as breeding females

(females with young), recent sightings and historical records of a Koala population;

(c) Identification of 'core Koala habitat' will require that a plan of management must accompany the DA application;

(d) If the rezoning of lands, other than to environmental protection, involves potential or core Koala habitat then the Director of planning may require a local environmental study be carried out.

One species of trees listed in Schedule 2 of the above policy as 'Koala Feed Tree Species' occur on the Site, namely *Eucalyptus haemastoma* (Scribbly Gum).

At no point where koala feed trees persist on site do they represent 15% or more of the total tree cover. Additionally, investigations did not detect Koalas or signs of Koalas within the Site. Therefore, the vegetation on the Site does not constitute Core Koala Habitat.

4.0 Potential Impacts

The following section provides an overview of the potential direct, indirect, cumulative and facilitative impacts associated with the Project. This overview has been used to inform the potential for impacts to occur to threatened species, populations and ecological communities (Section 6). The impacts identified herewith also inform the TSC Act 7 Part Test of Significance in **Appendix 1**.

4.1 Direct Impacts

The following direct impacts include habitat removal and the potential associated impacts on flora and fauna, and hydrological changes in relation to potential surface flow alterations and changes in water quality.

4.1.1 Habitat Removal

4.1.1.1 Vegetation

The Site represents the area over which vegetation removal is proposed to occur (as shown in **Figure 2**) encompassing an area of approximately 1.44 ha. A breakdown of the vegetation communities that occur within the Site are as follows:

- 0.73 ha MU 31 Coastal Plains Scribbly Gum Woodland
- 0.16 ha disturbed Coastal Plains Scribbly Gum Woodland
- 0.55 ha cleared/disturbed lands

4.1.1.2 Flora

The Project involves the removal of all flora from within MU 31 Coastal Plains Scribbly Gum Woodland and cleared/disturbed lands within the Site. Two threatened flora species were detected within the Site, namely *A. inopina* and *G. parviflora* subsp. *parviflora*.

Angophora inopina

Of the 22 individual *A. inopina* detected on the Site, all are proposed to be removed. Additionally, as this Project will be a component of the approved North Cooranbong Residential Project, the 22 individual *A. inopina* have been considered against the outcomes sought by the approval. To this end, the 22 *A. inopina* proposed to be removed represents a decrease of 0.02% of the overall population to be conserved across North Cooranbong Residential lands (refer to **Table 9**).

Table 9 *Angophora inopina* population estimations

Species	Existing numbers within Approved North Cooranbong Residential Development			Revised outcome including the Site			
	Estimated total number of stems			Known number of stems to be removed	Conservation Area estimated number of individuals	Revised Conservation outcome (%)	Difference between existing North Cooranbong and the Site combined (%)
	Conservation Area	Development Area	Percentage within the conservation area				
Angophora inopina	18,891	26,761	41.38%	22 in the Site (26,783 in development areas)	18,891	41.36%	0.02%

Grevillea parviflora subsp. *parviflora*

The individual *G. parviflora* subsp. *parviflora* detected within the Site is also proposed to be removed. Additionally, as this Project will be a component of the approved North Cooranbong Residential Development Project, the removal of one *G. parviflora* subsp. *parviflora* from the Site represents a decrease of 0.001% of the overall *G. parviflora* subsp. *parviflora* population to be conserved across the North Cooranbong Residential Development lands (refer to **Table 10**).

Table 10 *Grevillea parviflora* subsp. *parviflora* population estimations

Species	Existing numbers within Approved North Cooranbong Residential Development			Revised outcome including the Site			
	Estimated total number of stems			Known number of stems to be removed	Conservation Area estimated number of individuals	Revised Conservation outcome (%)	Difference between existing North Cooranbong and the Site combined (%)
	Conservation Area	Development Area	Percentage within the conservation area				
Grevillea parviflora subsp. *parviflora*	53,455	30,045	64.018%	1 in the Site (30,046 in development areas)	30,045	64.017%	0.001%

As the portion of *A. inopina* and *G. parviflora* subsp. *parviflora* represents an incremental amount of the overall population within the entire North Cooranbong Residential Development lands, both species are not expected to be significantly impacted upon by the Cooranbong LWC Project. Nevertheless, both species are assessed under the TSC Act 7 Part Test of Significance in **Appendix 1**.

4.1.1.3 Fauna

The habitats within the Site are predominantly characterised by dry open shrubby woodland. Cleared areas offer foraging resources for numerous terrestrial fauna species, including terrestrial mammals, reptiles and amphibians. The overall loss of habitat for terrestrial fauna is therefore the entire impact area of 1.44 hectares. Arboreal mammals and birds are more dependent upon wooded habitats. Therefore, loss of habitat for these fauna guilds may occur over 0.89 hectares. This loss includes loss of shelter in the form of hollows, logs, ground debris, dense vegetation and rocks, in unison with multiple forms of foraging resources.

Threatened species that may be impacted upon as a result of losing known or potential foraging and/or sheltering habitat include the Little Lorikeet, Powerful Owl, Squirrel Glider, Eastern Freetail Bat and Little Bentwing Bat. The 0.89 hectares of the more suitable wooded habitat represents the potential habitat loss for these species.

Woodland bird species would lose suitable roosting, nesting and foraging habitat with the loss of flowering shrubs and canopy trees within the Site. Predatory birds such as Powerful Owls and Masked Owls will lose foraging habitat in both vegetated and cleared lands in which their prey would occur. Therefore, up to 1.44 hectares of native habitat suitable for woodland birds and forest owls will be removed.

Although no hollows were observed on site, the abundance of hollow dwelling arboreal mammals observed on site would suggest the presence of some small hollows. The removal of small hollows from the wooded habitats within the Site would reduce habitat for potentially occurring threatened microbats and small arboreal mammals such as the Squirrel Glider.

4.1.2 Groundwater Dependent Ecosystems

As discussed in **Section 3.1.2.3**, MU 42 Red Mahogany Apple Paperbark Forest may have some degree of dependence on groundwater for its ecological function and therefore may constitute a GDE. This vegetation community does not occur on the Site however, hydrological alterations that may arise from the Project have been considered. Mitigation measures, as outlined in **Section 7**, will be implemented to ameliorate potential runoff from the development into this vegetation community. This MU is further assessed under the 7 Part Test of Significance in **Appendix 1**.

The regional impact of the Project on the GDEs identified in the Site is therefore likely to be negligible.

4.2 Indirect Impacts

The Project could have the following effects as a result of construction activities and ongoing activities at the LWC:

- Fragmentation of landscapes due to surface clearing;
- Edge effects from increased forest edges associated with clearing;
- Introduction/spread of invasive species;
- An increase in runoff from disturbed areas of land; and
- Accidental release of lubricants, oils, hydraulic fluids and fuel into surrounding environments;

The following sections discuss the potential indirect impacts associated with the Project.

4.2.1 Fragmentation

Fragmentation is the process of reducing what was once a continuous area of vegetation or habitat into smaller divided and discrete patches of vegetation in isolation. Fragmentation of landscapes reduces a species' ability to adapt to climatic conditions (NWCPAG 2012). Many fauna species are implicated by the process of fragmentation, including experiencing severe population declines (Robertson and Radford 2009). The overall ecology of fragmented patches may be detrimentally altered which influences flora and fauna assemblages (Lindenmayer et al. 1999).

Indirectly, fragmentation can put stress on native flora and fauna by increasing the amount of competition for resources and space of remaining fragments (Fischer and Lindenmayer 2007). Direct clearing can impact immobile organisms such as plants (and also mobile organisms that do not escape efficiently) leaving mobile animals to traverse to other surrounding environments that could be smaller remnants. This can result in overcrowding of an already overpopulated patch, interbreeding, and increased competition (Fischer and Lindenmayer 2007).

As cleared land occurs within and adjacent to the western side of the Site, the vegetation removal associated with the Project would increase existing cleared areas. The action will marginally contribute to fragmentation for the remaining vegetation to the south and north of the Site, however connective vegetation to the east on private property continues to provide a linear strip of habitat for fauna movement. This linear strip is also mapped on the Lake Macquarie Native Vegetation and Corridors mapping (2011) as a corridor less than 200 m in width.

4.2.2 Edge effects and weed invasion

As a result of vegetation clearing, edges of landscapes become more abundant, consequently increasing the amount of edge effects associated with cleared areas. Edge effects can influence ecological process by altering the flows of energy, moisture, temperature, materials or organisms and by providing access to spatially separated resources (Fletcher et al. 2007). In turn, this indirectly leads to changes in population structure, species interaction and community structure near edges (Fletcher et al. 2007).

The extent of edges will be increase to the existing north, east and south areas of vegetation as a result of clearing on the Site.

Weed infestations were observed and mapped across the Site (**Figure 7**) and were dominated by *Ligustrum sinense* (Small-leaved Privet), *Ligustrum lucidum* (Large-leaved Privet) and *Rubus fruticosus* agg. (Blackberry) as well as other exotic perennial grass species. These three species are known to readily invade areas of disturbance and outcompete with native plants for resources. Those that are present within the Site will be removed and disposed of appropriately, as outlined in the mitigation measures in **Section 7**.

4.2.3 Invasive Species

Invasive fauna species have been detected within the Site during surveys. Foxes, cats and dogs are known to take advantage of cleared areas to traverse areas (Rowley et al. 1999). Establishment of these species provides the opportunity for them to breed and thus increase predation levels and competition for resources with native wildlife. The Project may increase the accessibility to surrounding habitats for invasive species, however, the Project is unlikely to detrimentally affect invasive species numbers or behaviour.

4.2.4 Erosion and Sedimentation

The primary cause of erosion is vegetation removal, which exposes topsoil to the elements of water and wind (Thompson 2013). Areas proposed to be cleared will be predisposed to increased wind and water in the form of rainfall, ground water and surface flow. Excessive erosion can lead to increased runoff into the surrounding vegetation communities, particularly the conservation lands to the south.

Sedimentation can also occur as a result of pooling from altered soil landscapes. Sediment is also a pollutant in its own right and can release nitrogen and phosphorus into nearby water bodies causing eutrophication (Morgan 2009).

Erosion and sediment controls are being installed to ameliorate potential impacts into the surrounding natural environments and are detailed further in Table 20 of the EIS (RPS 2014).

4.2.5 Alteration and degradation of aquatic and riparian habitats

No aquatic habitats occur on the Site, however a man-made drainage line considered being in poor condition due to heavy weed encroachment occurs to the south within the Site. This drainage line exists within riparian vegetation MU 42 Red Mahogany Apple Paperbark Forest which is also an EEC under the TSC Act. Indirect impacts such as excess water flow and sedimentation and runoff may impact upon this sensitive area, however mitigation measures addressing these indirect issues have been discussed in Table 20 in the EIS (RPS 2014). These measures include water quality control, erosion and sedimentation control and waste management.

4.3 Key Threatening Processes

A Key Threatening Process (KTP) is defined in the TSC Act as a process that "threatens, or could threaten, the survival or evolutionary development of species, populations or ecological communities". They are listed under Schedule 3 of the TSC Act and may adversely affect threatened species, populations or ecological communities or could cause species, populations or ecological communities that are not threatened to become threatened.

Four KTP's have the potential to arise as a consequence of the Project:

- Anthropogenic Climate Change;
- Clearing of native vegetation;
- Invasion of native plant communities by exotic perennial grasses; and
- Infection of native plants by *Phytophthora cinnamomi*.

"Anthropogenic Climate Change"

Modification of the environment by humans is considered to contribute to Climate Change and as a result has been listed as a Key Threatening Process. Land use change and industrial processes which are occurring as a result of the Project are actions that can contribute to green house gas emissions. This may indirectly impact upon known or potentially occurring threatened species as most species depend on climate for their distribution (OEH 2000). Considering that the Project proposes to remove an incremental amount of vegetation (Approximately 1.44 ha), it is unlikely that the contribution to climate change from the activities on site will significantly impact upon known or potentially occurring threatened species, populations or communities.

"Clearing of native vegetation"

The KTP 'Clearing of Native Vegetation' lists a number of resulting factors that have the potential to cause declines or local extinctions for a variety of threatened species or EECs. These factors include:

(1) destruction of habitat resulting in loss of local populations of individual species;

(2) fragmentation;

(3) expansion of dryland salinity;

(4) riparian zone degradation;

(5) increased greenhouse gas emissions;

(6) increased habitat for invasive species;

(7) loss of leaf litter layer;

(8) loss or disruption of ecological function; and

(9) changes to soil biota.

Of the above list, the primary result of the Project is destruction of habitat of recorded or threatened species. The Project will require the removal of approximately 0.89 hectares of native vegetation and an additional 0.55 hectares of non-native vegetation. This involves the direct removal of potential habitat for *E. inopina and G. parviflora subsp. parviflora* that were recorded within the Site. Habitat for other potentially occurring threatened species such as *Tetratheca juncea* may also occur. As discussed in Section 4.1.1.1, the proposed loss of vegetation represents a small amount of habitat loss for those threatened species considered relevant to this Project. This small habitat loss is relative to the large amount of habitat available for these species in the locality.

"Invasion of native plant communities by exotic perennial grasses"

Due to the nature of the clearing activities and the prevalence of exotic perennial grasses on site there is potential for the spread of exotic perennial grasses into neighbouring native environments by wind and water. **Section 7** outlines mitigation measures to ensure that this KTP is ameliorated. On the condition that mitigation measures are adhered to, it is unlikely that the Project will contribute to this KTP.

"Infection of native plants by *Phytophthora cinnamomi*."

The soil born pathogen *Phytophthora cinnamomi* spreads in plant roots and has been known to infect a number of native plants, generally those from moist environments such as the riparian areas just outside of the Site. **Section 7** outlines mitigation measures to ensure that this KTP is ameliorated. On the condition that mitigation measures are adhered to, it is unlikely that the Project will contribute to this KTP.

4.4 Cumulative Impacts

This section provides additional information regarding the potential cumulative impacts of projects in the locality. A comparative and cumulative assessment of the impacts of each project to date on threatened species and EECs and the potential impacts predicted to occur as a result of the additional projects currently being considered are addressed herewith. Due to uncertainty about the environmental effects of some projects and the lack of attainable information available for review, a broad identification of what the key effects might be is addressed in this section.

4.4.1 North Cooranbong Residential Development

The approved North Cooranbong Residential Development, of which this project is a component of, covers an area of 365 ha and proposes to establish 201 ha of residential land, 2.75 ha commercial support, 15.25 ha public relation/open space, 17.70 ha for schools and 119.24 ha of environmental conservation lands. Approval has been given to develop 2,500 residential dwellings within the Development. The Development will upgrade the local road network to support the development and will install servicing and infrastructure to support existing and future urban development. The Development is divided up into precincts that will be developed as a staged development.

Surveys undertaken by Clements *et. al*. (2004) detected 312 flora species consisting of three threatened flora species, namely:

- *Angophora inopina* (Charmhaven Apple)
- *Grevillea parviflora* subsp. *parviflora* (Small-leaved Grevillea); and
- *Tetratheca juncea* (Black-eyed Susan).

Of the four vegetation communities delineated on the residential development lands, one was listed as Endangered under the TSC Act, namely;

- Swamp Sclerophyll Forest on Coastal Floodplain of the NSW North Coast, Sydney Basin and South East Corner bioregions.

Fauna surveys undertaken by Harper Somers (2002a,b, 2002, 2003 in Smith and Murray 2005) detected seven threatened fauna species within the site including the following:

- Glossy-black Cockatoo (*Calyptorhynchus lathami*);
- Eastern Freetail Bat (*Mormopterus norfolkensis*);
- Greater Broad-nosed Bat (*Scoteanax rueppellii*);
- Southern Myotis (*Myotis macropus*);
- Eastern Bent-wing Bat (*Miniopterus schreibersii oceanensis*);
- Little Bent-wing Bat (*Miniopterus australis*); and
- Grey-headed Flying-fox (*Pteropus poliocephalus*).

4.4.2 Cumulative Impacts Relative to this Project:

The approved North Cooranbong Residential Development will remove approximately 236.70 hectares of vegetation. Additionally, the approved North Cooranbong Residential Development will remove an estimated 30,045 individual *G. parviflora* subsp. *parviflora* and 26,761 *A. inopina* from within the development footprint. The retention of 53,455 and 18,891 *G. parviflora* subsp. *parviflora* and *A. inopina* respectively is proposed to occur within the 119.43 ha of designated Environmental Corridor Areas. The overall loss of vegetation within the approved development site is a loss of 236.70 ha of habitat for a number of threatened flora and fauna. Combining this Project with the approved North Cooranbong Residential Development's vegetation removal, the total area of habitat loss is 238.14 ha, the total estimated loss of *A. inopina* is 26,783 and the total estimated loss of *G. parviflora* subsp. *parviflora* is 30,046.

5.0 Threatened Species and Communities Likelihood of Occurrence Assessment

Threatened flora and fauna species (listed under the TSC Act and/or EPBC Act) that have been gazetted and recorded within a 10 kilometres radius of the Site have been considered within this assessment. Each species / community is considered for its potential to occur on the Site.

The likelihood of occurrence is presented in tabulated form (refer to **Table 11**):

'**Species / Community'** – Lists each threatened species / EEC known from the locality (10 km radius). The status of each threatened species under the TSC Act and the EPBC Act are also provided.

'**Habitat Description'** – Provides a brief account of the species / community and the preferred habitat attributes required for the existence / survival of each species / community.

'Likelihood of Occurrence on Site' – Assesses the likelihood of each locally recorded species and EEC to occur within the Site, using knowledge of each species' habitat and lifecycle requirements and with regard the habitat types present within the Site, results of the literature review and database searches and current field investigations. The location and number of records of the species (OEH Atlas of NSW Wildlife) were also considered in determining probability of occurrence.

'Potential for Impact' – Assesses the likelihood of impacts to each species / community that would result from the proposed development, taking into account direct and indirect short and long-term impacts.

Table 11 Threatened Species/Communities Assessment Table

Species/Community	TSC Act	EPBC Act	Habitat Description	Likelihood of Occurrence	Potential Impact
Flora					
Acacia bynoeana Bynoe's Wattle	E	V	Small, prostrate shrub found in low heath, open woodland, dry sclerophyll, generally on loamy clays and sand. Occurs from the Lower Hunter south to Southern Highlands. Recently found in several locations within the HEZ and other parts of the Cessnock LGA where it has been found growing in Kurri Sand Swamp Woodland (KSSW). Has also been recently recorded as isolated populations within Yellow Bloodwood Woodland and Blue-leaved Stringybark Woodland.	This species was not detected during field work across the Site, however it is known from Coastal Plains Scribbly Gum Woodland in the locality. This species has potential to be missed, even during its flowering period. This species has **potential** to occur.	The proposed activities may impact on this species habitat. A 7-part test of significance (TSC Act 1995) has been applied to this species in **Appendix 1**.
Angophora inopina Charmhaven Apple	V	V	Small to medium tree found in shallow sandy soils in open woodland, swamp woodland and wet heath. The main occurrences of this species are in the Wyong and Lake Macquarie LGA's (from Charmhaven to Wyee and Morisset, and north to near Toronto), with disjunct populations also in Port Stephens LGA (south of Karuah).	This species was **recorded** on site during surveys.	Due to this species being recorded during surveys on site, there is potential for impact on this species. A 7-part test of significance (TSC Act 1995) has been applied to this species in **Appendix 1**.
Asterolasia elegans	E	E	Occurs on Hawkesbury sandstone. Found in sheltered forests on mid- to lower slopes and valleys, e.g. in or adjacent to gullies which support sheltered forest. The canopy at known sites includes Turpentine (*S. glomulifera* subsp. *glomulifera*), Smooth-barked Apple (*A. costata*), Sydney Peppermint (*E. piperita*), Forest Oak (*A. torulosa*) and Christmas Bush (*C. gummiferum*).	Poor habitat for this species occurs throughout the Site . The known distribution of this species is restricted to the Hawkesbury/Nepean Catchment Management Authority boundary. This species is **unlikely** to occur within the disturbance footprints.	This species was not recorded on site and suboptimal habitat exists on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Cryptostylis hunteriana Leafless Tongue-orchid	E	V	A very rare leafless, saprophytic orchid, which has a symbiotic relationship with a mycorrhizal fungi which provides the plant with all its nutrient requirements. This orchid remains underground for the majority of its lifecycle, flowering periodically when conditions are optimal to reproduce. This species is extremely cryptic as it does not flower every year. Known to occur within a range of habitats including woodlands to swamp heaths. Within the Hunter region larger populations have been typically found in woodland dominated by *E. racemosa* (Scribbly Gum) and it prefers areas with an open grassy understorey. The species typically prefers moist sandy soils in sparse to dense heath and sedgeland, or moist to dry clay loams in coastal forests.	The Site contains vegetation that is suitable habitat for this species. Preferred habitat tends to be Scribbly Gum Woodland which occurs on site. This species was not recorded by RP, however surveys were conducted outside this species flowering period (Nov-Dec). Due to the cryptic nature of the species and the wide range of habitats where it has been recorded, it cannot be entirely discounted from occurring on Site. Therefore, there is **potential** for this species to occur.	The proposed activities may impact on this species habitat. A 7-part test of significance (TSC Act 1995) has been applied to this species in **Appendix 1**.
Eucalyptus parramattensis subsp. parramattensis	V	V	Red Gum species that grows in dry sclerophyll woodland on sandy soils, often in low damp sites. Locally this species occurs almost exclusively in association with Kurri Sand Swamp Woodland (KSSW) and ecotonal areas.	This conspicuous species has not been detected on site during thorough surveys across the Site. Therefore it is considered **unlikely** to occur.	This species was not recorded on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Grevillea parviflora subsp. parviflora Small-flower Grevillea	V	V	Occurs in light, clayey soils in woodlands. Most plants appear capable of suckering from a rootstock. Occurs within Werakata National Park. Much confusion surrounds the taxonomy of this species and other similar *Grevillea* taxa and a NPWS-funded study of the species is currently in progress.	This species was **recorded** on site during surveys.	Due to this species being recorded during surveys on site, there is potential for impact on this species. A 7-part test of significance (TSC Act 1995) has been applied to this species in **Appendix 1**.
Maundia triglochinoides	V	-	Grows in swamps, lagoons, dams, channels, creeks or shallow freshwater 30 - 60 cm deep on heavy clay, low nutrients. Associated with wetland species e.g. *Triglochin procerum*.	The seven records exist for this species within 10km of the site. Although there is a drainage line to the south of the site, it is degraded and experiences disturbances that would deter the presence of this species. Therefore it is considered **unlikely** to occur.	This species was not recorded on site and suboptimal habitat exists on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Melaleuca biconvexa Biconvex Paperbark	V	V	A shrub to small tree, which grows in poorly drained areas on the Central Coast with outlying populations at Jervis Bay and Port Macquarie. Records in the Hunter Region are confined to western Lake Macquarie (Atlas of NSW Wildlife data). It may occur in dense stands adjacent to watercourses, in association with other *Melaleuca* species or as an understorey species in wet forest. MU5 gully vegetation represents potential habitat for this species.	This conspicuous species was not recorded during comprehensive flora surveys. The small area of suitable habitat was traversed entirely without detection of *M. biconvexa*. Therefore, it is considered **unlikely** to occur.	This species was not recorded on site and suboptimal habitat exists on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.

Species/Community	TSC Act	EPBC Act	Habitat Description	Likelihood of Occurrence	Potential Impact
Pelargonium sp. Striatellum (G.W.Carr 10345) Omeo Storks-bill	E	E	A tufted perennial herb known to occur within the South Eastern Highlands, South East Corner IBRA Bioregions and the Hawkesbury-Nepean, Murrumbidgee, Southern Rivers and North East Natural Resource Management Regions. This species grows in exposed lake beds or just above the high water mark of intermittently inundated or ephemeral lakes.	This species has not been recorded on site or within 10km of the site. The site does not support suitable habitat. Therefore it is **unlikely** to occur.	This species was not recorded on site and suboptimal habitat exists on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Persicaria elatior Tall Knotweed	V	-	A small herb to 90cm tall, with tiny pink flowers. It occurs in disjunct populations along the east coast of NSW with the closest Hunter records occurring in Raymond Terrace. Prefers to grow in damp places, particularly beside streams and lakes.	This species is incredibly rare and has only been recorded once within 10km of the site. Surveys in sub-optimal habitat did not detect this species. Therefore, it is considered **unlikely** to occur.	This species was not recorded on site and suboptimal habitat exists on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Pterostylis gibbosa Illawarra Greenhood	E	E	Ground-dwelling orchid which grows in open forest or woodland on flat or gently sloping land with poor drainage. It is a deciduous orchid that is only visible above the ground between late summer and spring, only when soil moisture levels can sustain its growth. In the Hunter region, the species grows in open woodland dominated by Narrow-leaved Ironbark (*E. crebra*), Forest Red Gum (*E. tereticornis*) and Black Cypress Pine (*C. endlicheri*).	This species has not been detected during current or previous surveys and no records exist within 10km of the site. Known populations of this species predominantly occur on the Central Coast with a disjunct population located in the Hunter Valley. Therefore, it is considered **unlikely** to occur.	This species was not recorded on site and its distribution limits the likelihood of occurrence on site. Thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Rhizanthella slateri Eastern Underground Orchid	V	E	*Rhizanthella slateri* is an underground orchid with a whitish, fleshy underground stem to 15 cm long and 15 mm diameter. In NSW, it is currently only known from fewer than 10 locations, including near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wiseman's Ferry area, Agnes Banks and near Nowra. At each location, only a few individuals are known. However, *R. slateri* is difficult to detect, it is usually located when the soil is disturbed, and there may well be more locations of the species within its known range. The species grows in eucalypt forest but no informative assessment of the likely preferred habitat for the species is available.	This species has not been detected during comprehensive flora surveys and no records exist within 10km of the site. It is considered **unlikely** to occur.	This species was not recorded on site and its known populations limit the likelihood of occurrence on site. Thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Rutidosis heterogama Heath Wrinklewort	V	V	A small Asteraceous herb noted as occurring primarily within coastal heathland habitats. Near the site it occurs between Wyong and Evans Head. Is also known from sandy substrates or moist areas within open forest. Generally occurs at 860-1040m above sea level.	Current and previous surveys did not detect this species on site and only two records exist within 10km of the site. Given its primary habitat is heath and targeted searches did not detect this species on site, it is considered **unlikely** to occur.	This species was not recorded on site and suboptimal habitat exists on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Streblus pendulinus Siah's Backbone	-	E	This tall shrub or tree inhabits warmer rainforests along watercourses north from Milton, NSW.	Current and previous surveys did not detect this species on site and no records exist within 10km of the site. Warm rainforest in which this species prefers do not occur on site. Therefore it is considered **unlikely** to occur.	No suitable habitat for this species occurs on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Syzigium paniculatum Magenta Lilly Pilly	V	-	This tree species is associated with rainforests on sandy soils at low altitudes in coastal areas. Occurs on the east coast of NSW from the South Coast to the Lower Hunter.	This conspicuous species was not detected during thorough vegetation surveys across the site, and suitable rainforest vegetation does not occur. Therefore, it is **unlikely** to occur.	This species was not recorded on site and suboptimal habitat exists on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Tetratheca juncea Black-eyed Susan	V	V	Occurs in a variety of forested and heathy habitats. Locally found in Open Forests and Woodlands with dense, undisturbed understorey, often in association with *A. costata* / *C. gummifera* on slopes with south-easterly aspects.	Although targeted searches did not detect this species, there are 563 records within 10km of the site, and studies were undertaken outside the flowering period for this species, making it harder to detect. Given its abundance in the area, and suitable habitation site, it is considered as having **potential** to occur.	Suitable habitat for this species on site may be impacted upon as a result of the Project. A 7-part test of significance (TSC Act) has been applied to this species in **Appendix 1**.
Amphibians					
Crinia tinnula *Wallum Froglet*	V	-	This species occurs along the coastal margin of Australia from Litabella National Park in South-east QLD to Kurnell in Sydney NSW. Found in a range of habitats with a focus on moist environments, usually associated with acidic swamps on coastal sand plains. Occur in sedgelands and wet heathlands. Breeds in swamps in permanent water as well as shallow ephemeral pools and drainage ditches. Shelter under leaf litter, vegetation or in burrows and sites are often wet and near the water's edge.	No suitable riparian habitats occur on site for the Wallum Froglet. It is considered unlikely to occur.	This species was not recorded on site and suboptimal habitat exists on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.

Species/Community	TSC Act	EPBC Act	Habitat Description	Likelihood of Occurrence	Potential Impact
Heleioporus australiacus Giant Burrowing Frog	V	V	Occurs on the eastern slopes of the Great Dividing Range from near Mt Coridudgy and Kings Cross in Wollemi National Park in NSW. Preferred habitats are associated with sandstone plateaus or ridges that support heath or sclerophyll vegetation as well as near semi-permanent to ephemeral rock based stream. They require native vegetation where they occur. Breeding typically occurs in late summer or autumn following heavy rains. Mating occurs in ephemeral pools, shallow water of small soaks.	This species is generally restricted to Hawkesbury Sandstone which is not present on site. Therefore, it is considered **unlikely** to occur.	This species was not recorded on site and suboptimal habitat exists on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Litoria aurea Green and Golden Bell Frog	E	V	Inhabits swamps, lagoons, streams and ponds as well as dams, drains and storm water basins. Thought to be displaced from more established sites by other frog species, thus explaining its existence on disturbed sites. Previously widespread within the region, but now sparsely distributed within the Lower Hunter and Central Coast areas. A relatively stable population occurs on Kooragang Island.	The site does not support preferred aquatic habitats for the species, and no records occur within a 10km radius of the site. Therefore it is **unlikely** to occur.	This species was not recorded on site and suboptimal habitat exists on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Litoria littlejohni Littlejohns Tree Frog	V	V	A pale brown frog with dark speckles which occurs along permanent rocky creeks with thick fringing vegetation associated with eucalypt woodlands and heaths among sandstone outcrops. Occurs on the plateaus and eastern plains of the Great Dividing Range. Records within the Hunter Region occur from within the Watagan State Forest.	No permanent rocky creeks or suitable aquatic habitat is present on site for this species. Therefore it is considered **unlikely** to occur.	This species was not recorded on site and suboptimal habitat exists on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Mixophyes balbus Stuttering Frog	E	V	Found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range. Breed in streams during summer after heavy rain, outside the breeding season adults live in deep leaf litter and thick understorey vegetation on the forest floor. Eggs are laid on rock shelves or shallow riffles in small, flowing streams.	No suitable rainforest in association with streams persist on site in which this species would occur. Therefore it is **unlikely** to occur.	This species was not recorded on site and suboptimal habitat exists on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Mixophyes iteratus Giant Barred Frog	E	E	Mostly restricted to wet sclerophyll forest and rainforest, including Antarctic Beech forest. Usually found within close proximity to permanent running water (Robinson, M, 1998). Hunter Region records are largely confined to the Watagan National Park and to the north of Heaton State Forest (Atlas of NSW Wildlife data).	No suitable rainforest persist on site in which this species would occur. Therefore it is **unlikely** to occur.	This species was not recorded on site and suboptimal habitat exists on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Pseudophryne australis Red-crowned Toadlet	V	-	This species has a restricted distribution within the Sydney Basin from Pokolbin in the North to Nowra in the south and west to Mt Victoria in the Blue Mountains. Inhabits open forests on Hawkesbury and Narrabeen Sandstones and visits wet drainage lines below sandstone ridges. Breeding occurs in groups among dense vegetation beside ephemeral creeks and drainage lines.	Although this species was recorded within 10km of the site, suitable habitats associated with sandstones are not available on site for this species. Therefore it is **unlikely** to occur.	This species was not recorded on site and suboptimal habitat exists on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Reptiles					
Hoplocephalus bungaroides Broad-headed Snake	E	E	Largely confined to Triassic sandstones, including the Hawkesbury, Narellan and Shoalhaven formations, within the coast and ranges. Nocturnal, sheltering in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. Moves from the sandstone rocks to shelters in hollows in large trees within 200 m of escarpments in summer.	This species has not been recorded on site or within 10km of the site. It is largely limited to exposed rocky outcrops which do not persist on site. It is highly **unlikely** to occur.	This species was not recorded on site and suboptimal habitat exists on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Hoplocephalus stephensii Stephens Banded Snake	V	-	Occurs on Australia's' east coast from southern QLD to Gosford in NSW. Inhabits rainforest and eucalypt forests and rocky areas in association with the vegetation types up to 950 m altitude. A nocturnal species that utilises loose tree bark and tree trunks, rock slabs and crevices for sheltering.	Five records exist within a 10km radius of the site, however these are in higher altitude areas. The habitat on site does not exhibit the characteristics required by this species. Therefore, It is **unlikely** to occur.	This species was not recorded on site and suboptimal habitat exists on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.

Species/Community	TSC Act	EPBC Act	Habitat Description	Likelihood of Occurrence	Potential Impact
Birds					
Anthochaera Phrygia Regent Honeyeater	CE	E	Nomadic Honeyeater that disperses to non-breeding areas, including the coast, in winter, where flowering trees are sought. Within the region, mostly recorded in Box-Ironbark Eucalypt associations along creek flats, river valleys and foothills. Coastal swamp forests in Lower Hunter are used when more western resources fail. The main feed tree for coastal areas is *E. robusta* (Swamp Mahogany). Hunter records are more common in near coastal areas such as Cessnock LGA. Feed trees in this region are *C. maculata* (Spotted Gum), *E. fibrosa* (Broad-leaved Ironbark), *E. crebra* (Narrow-leaved Ironbark) and various stringybark sp. Nests mainly west of the divide, although local breeding attempts have occurred at Quorrobolong.	No favoured foraging habitat for the Regent Honeyeater occurs on site, however, one species, namely *Eucalyptus robusta* occurs within the Site. Of the canopy species that occur on site, these are considered suboptimal foraging species. Regent Honeyeaters are known to use the area during winter migration and given the suitable habitat in the surrounding area its presence cannot be discounted. Therefore, it is considered as having **potential** to occur.	Potential habitat for this species on site may be impacted upon as a result of the Project. A 7-part test of significance (TSC Act) has been applied to this species in **Appendix 1**.
Botaurus poiciloptilus Australasian Bittern	E	E	The distribution of this species ranges from south-east Queensland to south-east South Australia, Tasmania and south-west of Western Australia. Preferred habitat includes permanent and seasonal freshwater habitats. It forages in shallow water in wetlands with tall dense vegetation.	This species was not detected on site or within a 10km radius of the site. Suitable habitat in the form of permanent freshwater habitats and wetlands do not persist on site.. Therefore it is considered **unlikely** to occur.	This species was not recorded on site and suboptimal habitat exists on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Burhinus grallarius Bush Stone-curlew	E	-	In NSW this species is found throughout most of the state. Disjunct populations occur along the east coast with small populations known from Port Stephens and the Central Coast. Inhabits open forests and woodlands with sparse understorey and fallen timber. Mostly nocturnal. Nests on the ground in spring and late summer.	Woodland environments do occur on site, however they primarily contain dense heath-like under storeys or are waterlogged (swamp woodland to the south). No open environments preferred by this species are present on site. Therefore, it is **unlikely** to occur.	This species was not recorded on site and suboptimal habitat exists on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Calidris ferruginea Curlew Sandpiper	E	M	This species has a widespread distribution in NSW east of the Great Divide, particularly in coastal regions. The Curlew Sandpiper inhabits intertidal mudflats in estuaries and bays, lakes and lagoons	A single record for this species occurs within 10km of the site, and coastal habitats in which this species requires do not persist on site. Therefore it is considered **unlikely** to occur.	This species was not recorded on site and suboptimal habitat exists on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Callocephalon fimbriatum Gang-gang Cockatoo	V	-	In summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In winter, may occur at lower altitudes in drier more open eucalypt forests and woodlands, and often found in urban areas. Move to lower altitudes in winter, preferring more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas. Favours old growth attributes for nesting and roosting.	This species was not detected on site however 31 records exist within 10km of the site. Their distribution is limited to the forests at higher altitude in the Lake Macquarie LGA, however vagrants could visit the site for foraging purposes. Therefore it is considered as having **potential** to occur.	Due to the removal of eucalypt trees as a result of the Project, it is considered that the Project may have a significant impact upon this potentially occurring species. A 7-part test of significance (TSC Act) has been applied to this species in **Appendix 1**.
Calyptorhynchus lathami Glossy Black-Cockatoo	V	-	Occurs in forests and woodlands where it forages predominantly on *Allocasuarina* cones. Requires large Eucalypt tree hollows for nesting. Sparse occurrences on the valley floor, but resident in ranges and adjacent areas surrounding the Hunter Valley. Most commonly encountered around the south and south western areas of the lake and in the Watagan Mountains N.P. These locations have good stands of *Allocasuarina* sp., especially *A. littoralis* (Black She-oak)	Although this species was not detected during surveys, Allocasuarina species occur on site in which this species depends for foraging. Additionally 84 records exist within 10km of the site. It is therefore considered as having **likely** to occur.	The proposed activities may impact on this species habitat. A 7-part test of significance (TSC Act 1995) has been applied to this species in **Appendix 1**.
Chthonicola sagittata Speckled Warbler	V	-	Occupies Eucalypt and Cypress woodlands in drier coastal areas and on the western slopes of the Great Dividing Range. Appears unable to persist in districts where no forested fragments larger than 100 hectares remain. Occurs in the central and southern Hunter Region where suitable habitat exists. Associated with extensive stands of *B. spinosa* (Blackthorn) in some areas (HBOC).	This species was not detected on site and only a single record exists within a 10km radius of the site. Although woodlands do occur on site, this species generally prefers these habitats when they are associated with ridge tops and gullies. Therefore it is considered as having **unlikely** to occur.	This species was not recorded on site and suitable habitat does not exist on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.

Species/Community	TSC Act	EPBC Act	Habitat Description	Likelihood of Occurrence	Potential Impact
Climacteris picumnus victoriae Brown Treecreeper (eastern subsp.)	V	-	Frequents drier forests and woodlands, particularly open woodland lacking a dense understorey. Also found in grasslands in proximity to wooded areas where there are sufficient logs, stumps and dead trees nearby. Occasionally found in mallee and *E. camaldulensis* (River Red Gum) forest bordering wetlands with an open understorey of *Acacia* sp., *Muehlenbeckia* sp. (Lignum), *Typha* sp. (Cumbungi) and *Poa* sp. (grasses). Feeds on invertebrate larvae and small insects, particularly ants. Utilises hollows for roosting/nesting.	This species was not detected on site and only two records exist within a 10km radius of the site. Suitable habitat is suboptimal for this species and they tend to occur in more western environments. Therefore it is considered **unlikely** to occur.	This species was not recorded on site and suitable habitat does not exist on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Daphoenositta chrysoptera Varied Sittella	V	-	Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland.	This species was not detected on site however 16 records exist within 10km of the site. This species rarely persists in habitat fragments that are less than 100 hectares in a remnant patch. The habitat on site does not provide a suitable amount of continuous habitat to sustain this species. Therefore it is considered **unlikely** to occur.	This species was not recorded on site and suitable habitat does not exist on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Dasyornis brachypterus Eastern Bristlebird	E	E	The Eastern Bristlebird occurs in three separate populations; one in south-east Queensland and north-east NSW and the other two south of Wollongong (NSW). It inhabits a wide range of habitats including sedgeland, heathland, sclerophyll forest, woodland and rainforest.	This species was not detected on site or within 10km of the site. The distribution of this species persists as three disjunct populations, the closest one being on the Central Coast of NSW. Based on this distribution and lack of records it is considered **unlikely** to occur.	This species was not recorded on site and the site is outside of its known distribution, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Ephippiorhynchus asiaticus Black-necked Stork	E	-	Inhabits swamps associated with river systems and large permanent pools but sometimes appears on the coast or in estuaries. It has also been recorded on farm dams and sewage treatment ponds. Within the Hunter Region it occurs spasmodically on freshwater or estuarine wetlands, along coastal and near coastal environments such as Gloucester.	This species was not detected on site however 16 records exist within 10km of the site. Suitable river systems and swamps do not persist on site. The areas of inundated swamp woodland are not considered suitable habitat as they are semi-permanent and isolated. Therefore it is considered **unlikely** to occur.	This species was not recorded on site and suitable habitat does not exist on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Epthianura albifrons White-fronted Chat	V	-	*Epthianura albifrons* is found in damp open habitats, particularly estuarine and marshy grounds, as well as wetlands containing Saltmarsh, bordered by open grasslands or lightly timbered lands (Higgins et al. 2001). The species is also observed in open grasslands and sometimes in low shrubs bordering wetland areas. Inland, the White-fronted Chat is often observed in open grassy plains, salt lakes and saltpans that are along the margins of rivers and waterways (Higgins et al. 2001; Barrett et al. 2003). The species is sensitive to human disturbance and is not found in built areas. *Epthianura albifrons* (White-fronted Chat) is endemic to Australia, extending across the southern half of Australia. Found mostly in temperate to arid climates and very rarely seen in sub-tropical areas, *E. albifrons* occupies foothills and lowlands below 1000 m above sea level (Higgins et al. 2001; Barrett et al. 2003).	This species was not detected on site and only one record exists within a 10km radius of the site. Suitable saline environments in the form of estuaries, saltmarshes and wetlands do not persist on site. Therefore it is considered **unlikely** to occur.	This species was not recorded on site and suitable habitat does not exist on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Erythrotriorchis radiates Red Goshawk	CE	V	The Red Goshawk is sparsely distributed from western Kimberley to the north-eastern NSW. Preferred habitat in NSW includes subtropical rainforest and Melaleuca forest along coastal rivers. Records in NSW are rare.	This species was not detected on and only a single record exists within 10km of the site. Due to its preference of foraging among subtropical rainforest and melaleuca forest along coastal rivers, the habitat on site does not constitute suitable foraging habitat for this species. Therefore it is considered **unlikely** to occur.	This species was not recorded on site and suitable habitat does not exist on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Glossopsitta pusilla Little Lorikeet	V	-	*Glossopsitta pusilla* extends from Cairns to Adelaide coastally and to inland locations. Commonly found in dry, open eucalypt forests and woodlands. Can be found in roadside vegetation to woodland remnants. *G. pusilla* feeds on abundant flowering Eucalypts, but will also take nectar from *Melaleuca* sp and *Mistletoe* sp. *E. albens* (White Box) and *E. melliodora* (Yellow Box) are favoured food sources on the western slopes in NSW. On the eastern slopes and coastal areas favoured food sources are *C. maculata* (Spotted Gum), *E. fibrosa* (Broad-leaved Ironbark), *E. robusta* (Swamp Mahogany) and *E. pilularis* (Blackbutt). Nesting takes place in hollow bearing trees.	This species was not detected on site, however 31 records exist within 10km of the site. Multiple flora types including mistletoe, eucalypts and Melaleucas occur on site that are suitable foraging plants for Little Lorikeets. Therefore, there is **potential** for this species to occur.	The Project may have a significant impact on this potentially occurring species. Therefore a 7-part test of significance (TSC Act) has been prepared for this species in **Appendix 1**.

Species/Community	TSC Act	EPBC Act	Habitat Description	Likelihood of Occurrence	Potential Impact
Haematopus fuliginosus Sooty Oystercatcher	V	-	Sooty Oystercatchers are found along the entire NSW coast including offshore islands. Preferred habitats include rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries. They forage for small molluscs and crustaceans in exposed rocks and reefs. Breeding occurs in spring and summer typically on off shore islands.	This species was not detected on site however a single record exists within 10km of the site. This species is associated solely with coastal environments such as those previously listed. No suitable habitats for this species exist on site. Therefore it is considered **unlikely** to occur.	This species was not recorded on site and suitable habitat does not exist on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Hieraaetus morphnoides Little Eagle	V	-	Can be found across most of Australia, but more commonly found near coastal to inland regions in NSW and Victoria. This species is part-migratory to nomadic and dispersive in some areas.	This species was not detected on site however three records exist within 10km of the site. This species occupies a wide range of habitats and has a wide distribution. Therefore it is considered as having **potential** to occur.	The Project may have a significant impact on this potentially occurring species. Therefore a 7-part test of significance (TSC Act) has been applied to this species in **Appendix 1**.
Ixobrychus flavicollis Black Bittern	V	E	Solitary species, living near water (estuarine to brackish) in mangroves and other trees which need to form only a narrow fringe of cover. A riparian species that occasionally ventures into the open within estuarine habitats. Sedentary resident along Dora and Stockton Creeks in western Lake Macquarie has also been recorded semi-regularly in the Paterson River but is likely to occur in any brackish to estuarine forested coastal creeks in the lower NSW coast.	This species was not detected on site however two records exist within 10km of the site. Mangroves and estuaries in which this species habituates do not occur on site. Therefore it is **unlikely** to occur.	This species was not recorded on site and suitable habitat does not exist on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Lathamus discolour Swift Parrot	E	E	On the mainland this species frequents Eucalypt forests and woodlands with large trees having high nectar production during winter. Mainland winter foraging sites often vary from year to year. Nests only in Tasmania, but regularly visits the Hunter Region in winter. Visits the Hunter Region when food sources are abundant or food sources are lacking in other areas. Food sources used in the Hunter include *E. robusta* (Swamp Mahogany) on the coast, and near coastal to inland *Lathamus discolour* uses *C. maculata* (Spotted Gum), *E. fibrosa* (Broad-leaved Ironbark) and *E. crebra* (Narrow-leaved Ironbark). Occasional records have come from *E. alba* (White Box) and *E. sideroxylon* (Mugga Ironbark). These food source trees have been recorded as roosting sites for *L. discolor*.	No favoured foraging habitat for the Swift Parrot occurs on site, however one species, namely *Eucalyptus robusta* occurs within the Site. Of the canopy species that occur on the Site, these are considered suboptimal foraging species. Swift parrots are known to use the area during winter migration and given the suitable habitat in the surrounding area its presence cannot be discounted. Therefore, it is considered as having **potential** to occur.	Potential habitat for this species on site may be impacted upon as a result of the Project. A 7-part test of significance (TSC Act) has been applied to this species in **Appendix 1.**
Lophoictinia isura Square-tailed Kite	V	-	Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. Nest sites generally located along or near watercourses, in a fork or on large horizontal limbs.	The woodlands on site are not near watercourses in which this species prefers, and records in the area are scarce. It is therefore, considered **unlikely** to occur.	This species was not recorded on site and suitable habitat does not exist on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Neophema pulchella Turquoise Parrot	V	-	The Turquoise Parrot's range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range. Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Prefers to feed in the shade of a tree and spends most of the day on the ground searching for the seeds or grasses and herbaceous plants, or browsing on vegetable matter.	This species was not recorded during field surveys. Potential foraging, nesting and roosting habitat exists, however, chance of occurrence is considered low as only a few records exist within the 10 km radius of the site. Therefore, it is considered **unlikely** to occur.	This species was not recorded on site and known records are low in the area, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Ninox strenua Powerful Owl	V	-	Occurs in wet or dry sclerophyll forests and woodlands where suitable prey species occur (being predominantly arboreal mammals). Requires large hollows, usually in Eucalypt trees, for nesting. Roosts in dense vegetation within such areas. Roosts in dense vegetation within such species as *S. glomulifera* (Turpentine), *A. littoralis* (Black She-Oak), *A. melanoxylon* (Blackwood), *A. floribunda* (Rough-barked Apple), *E. cupressiformis* (Cherry Ballart) and *M. nodosa* (Ball Honeymyrtle). Many coastal records exist across the Hunter region.	A high abundance of small mammals were detected on site on which this species could forage. No hollows large enough to support owls were found on site, therefore the site offers foraging habitat only. 37 records exist within 10km of the site. It is considered as having **potential** to occur.	The Project may have a significant impact on this potentially occurring species. Therefore a 7-part test of significance (TSC Act) has been applied to this species in **Appendix 1**.
Oxyura australis Blue-billed Duck	V	-	Blue-billed Ducks are widespread through NSW, though mainly found south of the Murray-Darling Basin. Young birds may disperse widely. They are almost wholly aquatic, preferring deep water in large permanent wetlands or dams where aquatic flora is abundant. Blue-billed Ducks feed on the seeds and leaves of freshwater plants as well as on midges, caddisfly and dragonfly larvae.	This species was not detected on site and only as single record exists within 10km of the site. This species is highly aquatic requiring bodies of deep water. This habitat feature does not occur on site. Therefore it is considered **unlikely** to occur.	This species was not recorded on site and suitable habitat does not exist on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.

Species/Community	TSC Act	EPBC Act	Habitat Description	Likelihood of Occurrence	Potential Impact
Pandion cristatus Eastern Osprey	V	M	Ospreys are found right around the Australian coast line, except for Victoria and Tasmania. They are common around the northern NSW coast, especially on rocky shorelines, islands and reefs. The species is uncommon to rare or absent from closely settled parts of south eastern Australia. There are few records from inland areas.	This species was not detected on site however eight records exist within 10km of the site. Ospreys are coastline specialists focusing on reefs, shorelines and islands, all of which are not associated within the site. Therefore it is considered **unlikely** to occur.	This species was not recorded on site and suitable habitat does not exist on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Petroica boodang Scarlet Robin	V	-	Ranges from SE Qld to the Victoria coast into South Australia. Also occurs in Western Australia in the south west. *P. boodang* occur in single, pairs, in summer, forages in stringybark, other eucalypt woodland, from stumps, low branches (Pizzey 2007). Perches prominently, flying down swiftly to seize prey. Is part migratory in which in autumn/winter moves to more open habitats. Habitat are foothill forests, woodlands, watercourses, in autumn/winter more open habitats, river red gum woodlands, golf courses, parks, orchards and gardens (Pizzey 2007).	This species was not detected and only a single record exists within 10km of the site. This species is generally associated with more western habitats. Therefore, it is considered **unlikely** to occur.	This species was not recorded on site and the site is considered outside this species primary distribution, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Pomatostomus temporalis temporalis Grey-crowned Babbler (eastern subspecies)	V	-	Inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains. As well as open Eucalypt woodlands with a grassy groundcover and sparse, tall shrub layer. *P. temporalis temporalis* may also be observed along streams in cleared areas and grassy road verges.	Box gum Woodlands with grassy understorys do not persist on site. Only a single record exists within 10km of the site. It is therefore, considered **unlikely** to occur.	This species was not recorded on site and suitable habitat does not exist on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Ptilinopus regina Rose-crowned Fruit-dove	V	-	In NSW, this species occurs in the north of the state from the New England Tableland to Port Stephens in the south. Vagrants have been known to fly further south as far as Sydney, Victoria and Tasmania. Typically occurs in rainforest environments especially with vines and abundant fruit. Nests in the mid-story shrub layer and breeds summer and spring.	No rainforest habitats abundant in foraging resources are available for this species on site. Only a single record exists within 10km of the site. Therefore it is considered **unlikely** to occur.	This species was not recorded on site and suitable habitat does not exist on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Ptilinopus superbus Superb Fruit-dove	V	-	This species occurs primarily in the north eastern portion of NSW, with records further south becoming less common. Vagrant records have been recorded as far south as Victoria and Tasmania. Occurs in rainforest and closed forest habitats with abundant fruit. Breeding occurs from September to January.	No rainforest habitats abundant in foraging resources are available for this species on site. Only a single record exists within 10km of the site. Therefore it is considered **unlikely** to occur.	This species was not recorded on site and suitable habitat does not exist on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Rostratula australis Australian Painted Snipe	E	V	This species has a widespread distribution along the east coast of Australia. Preferred habitats include shallow freshwater wetlands, swamps and inundated grassland.	This species was not detected on or within 10km of the site. It requires wetlands, swamps and/or inundated grasslands all of which do not occur on site. Therefore it is considered **unlikely** to occur.	This species was not recorded on site and suitable habitat does not exist on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Stagonopleura guttata Diamond Firetail	V	-	This species has a wide distribution across NSW with concentrations from the Northern and Southern Tablelands, the Northern, Central and South Western Slopes and the North West Plains and Riverina. Known records do occur within the Hunter region. Inhabits grassy eucalypt woodlands and grasslands. Occurs in flocks from 5 - 40. Breeds between August and January and nests in shrubby understoreys.	This species is typically known from more western and drier environments than that on site. One record exists within 10km of the site and it was not detected onsite during surveys. It is considered **unlikely** to occur.	This species was not recorded on site and the site is outside its primary distribution, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Stictonetta naevosa Freckled Duck	V	-	Occurs in the river-dependent wetlands of south-eastern Australia, including the Murray- Darling and Lake Eyre regions, and southwest western Australia. Generally inhabits plankton-rich lentic freshwaters, particularly marshes with dense vegetation of lignum, cumbungi, canegrass, paperbark or tea-tree. Although freshwaters are favoured, waterbodies of various salinities are utilised. The preferred breeding habitats are permanent freshwater swamps or creeks with dense vegetation.	This species was not detected on site and only a single record exists within 10km of the site. Freckled Ducks require permanent bodies of water in the form of swamps and marshes, both of which do not occur on site. Therefore it is consider **unlikely** to occur.	This species was not recorded on site and suboptimal habitat exists on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Tyto novaeholladiae Masked Owl	V	-	Found in a range of habitats, locally within sclerophyll forests and woodlands where appropriate/preferred prey species occur (being predominantly terrestrial mammals). Requires large Eucalypt hollows for nesting and prefers to roost in these hollows as well.	This species was heard responding to call playback surveys from outside the Site. An abundance of suitable prey species are present on site for the Masked Owl, therefore it is considered as having potential to utilise the Site for foraging as part of a larger home range.	The Project may have a significant impact on this potentially occurring species. Therefore a 7-part test of significance (TSC Act) has been applied to this species in **Appendix 1**.

Species/Community	TSC Act	EPBC Act	Habitat Description	Likelihood of Occurrence	Potential Impact
Tyto tenebricosa Sooty Owl	V	-	Occurs in wet Eucalypt forest and rainforest with tall emergent trees, often in easterly facing gullies. Within these areas this species hunts for a range of mainly mammalian prey at all levels of the forest strata, even recorded feeding on ground (RPS ecologist pers. obs.). Roosts in tree hollow or dense canopy vegetation. Also nests in large Eucalypt tree hollows. Most Hunter records exist from the Watagan mountains (OEH 2012a), but this species has also been observed to the southwest of Awaba (RPS per obs.).	This species was not detected on site however 32 records exist within 10km of the site. The site supports potential foraging habitat, and an abundant food source in the form of small mammals are present on site. Therefore it is considered as having **potential** to occur.	The Project may have a significant impact on this potentially occurring species. Therefore a 7-part test of significance (TSC Act) has been applied to this species in **Appendix 1**.
Mammals					
Chalinolobus dwyeri Large-eared Pied Bat	V	V	This species forages in tall open forests and the edges of rainforest. It roosts in mine shafts and similar structures. Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of *H. ariel* (Fairy Martin), frequenting low to mid-elevation dry open forest and woodland close to these features. Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves. They remain loyal to the same cave over many years. Found in well-timbered areas containing gullies. The relatively short, broad wing combined with the low weight per unit area of wing indicates manoeuvrable flight. This species probably forages for small, flying insects below the forest canopy. Hunter Region records for this species are largely confined to the Watagan Mountains, but it has been recorded on the southern side of Port Stephens (OEH 2012a).	This species was not detected on site and only a single record exists within 10km of the site. Based on its habitat preference of rainforest edges and the use of caves and existing mining shafts for roosting, it is considered **unlikely** to occur as these habitat requirements do not persist on site.	This species was not recorded on site and suitable habitat does not exist on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Dasyurus maculatus maculatus Spotted-tailed Quoll (SE Mainland Pop)	V	E	Found in a variety of forested habitats. This species creates a den in fallen hollow logs or among rocky outcrops. Generally does not occur in otherwise suitable habitats that are in close proximity to urban development. Hunter Region records are largely confined to the surrounding ranges (OEH 2012a).	This species was not detected on site however 15 records exist within 10km of the site. The site supports potential foraging habitat, however no suitable den habitats are available. The surrounding environment is largely urban development which limits the potential presence of this species. Therefore it is **unlikely** to occur.	This species was not recorded on site and suitable habitat does not exist on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Falsistrellus tasmaniensis Eastern False Pipistrelle	V	-	This species is found in a variety of forest types such as open forests, woodlands and wetter sclerophyll forests (usually with trees >20m). This species roosts in tree hollows and caves. Appears to locally favour upland habitats. A limited number of records occur on the central coast and the Lower Hunter Region (OEH 2012a).	This species was not recorded on site during surveys. Four records exist within 10km of the site. The site does offer foraging habitat for this species. Therefore it is considered as having **potential** to occur.	The Project may have a significant impact on this potentially occurring species. Therefore a 7-part test of significance (TSC Act) has been applied to this species in **Appendix 1**.
Kerivoula papuensis Golden-tipped Bat	V	-	This species occurs along the east coast of Australia. In NSW it extends from the QLD border to south of Eden in southern NSW. Inhabits rainforests or wet and dry sclerophyll forest adjacent to rainforests. Has also been recorded in Melaleuca and riparian forests. Roosts in abandoned nests of particular ground dwelling birds, tree hollows and dense foliage. Utilises an area of two kilometres within its roost to forage within. Specialist feeder on small web-building spiders.	Melaleuca forests on site provide potential foraging habitat for this species. It is considered as having **potential** to occur.	The Project may have a significant impact on this potentially occurring species. Therefore a 7-part test of significance (TSC Act) has been applied to this species in **Appendix 1**.
Macropus parma *Parma Wallaby*	V	-	This species range has restricted from what was north-eastern NSW to Bega in the southeast, to a confined area of the coast and ranges of central and northern NSW from the Gosford district to the QLD border. Inhabits moist eucalypt forest with thick shrubby understorey. Feeds nocturnally on grass and herbs and shelters in dense cover during the day.	Although the habitat on site has both a dense understory and moist environments, the urbanised and fragmented nature of the site would most likely deter the persistence of this species from the site. It is therefore, **unlikely** to occur.	This species was not recorded on site and suboptimal habitat exists on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Miniopterus australis Little Bentwing-bat	V	-	Prefers to forage in well-vegetated areas, such as within wet and dry sclerophyll forests and rainforests. Requires caves or similar structures for roosting habitat. Largely confined to more coastal areas in the Lower Hunter Region (OEH 2012a).	This species was **recorded** on site.	The Project may have a significant impact on this recorded species. Therefore a 7-part test of significance (TSC Act) has been applied to this species in **Appendix 1**.

Species/Community	TSC Act	EPBC Act	Habitat Description	Likelihood of Occurrence	Potential Impact
Miniopterus schreibersii oceanensis Eastern Bentwing-bat	V	-	This species utilises a range of habitats for foraging, including rainforest, wet and dry sclerophyll forests, woodlands and open grasslands. Requires caves or similar structures for roosting habitat. Widely distributed across the Lower Hunter Region (OEH 2012a).	This species was not recorded on site, however 23 records exist within 10km of the site and the results within the Anabat report (Appendix 5) state that this species has **potential** to occur.	The Project may have a significant impact on this potentially occurring species. Therefore a 7-part test of significance (TSC Act) has been applied to this species in **Appendix 1**.
Mormopterus norfolkensis Eastern Freetail-bat	V	-	This species is distributed south of Sydney extending north into south-eastern Queensland. There are no records west of the Great Dividing Range. Most records of this species have been reported from dry Eucalypt forest and woodland. It is expected that open forested areas and the cleared land adjacent to bushland, constitutes important habitat for this species. It is a predominantly tree-dwelling species, roosting in hollows or behind loose bark in mature Eucalypts. Widely distributed across the Lower Hunter Region (OEH 2012a).	This species was **recorded** on site.	The Project may have a significant impact on this recorded species. Therefore a 7-part test of significance (TSC Act) has been applied to this species in **Appendix 1**.
Myotis macropus Southern Myotis	V	-	Usually found near bodies of water, including estuaries, lakes, reservoirs, rivers and large streams, often in close proximity to their roost site. Although usually recorded foraging over wet areas, it also utilises a variety of wooded habitats adjacent to such areas including rainforest, wet and dry sclerophyll forest, woodland, and swamp forest. Roosts in small colonies of between 15 and several hundred individuals in caves, mines and disused railway tunnels. A number of records from the Central Coast, with fewer numbers in the Lower Hunter Region (OEH 2012a) and Central Hunter Region (RPS pers. obs.).	This species was not recorded on site, however 16 records exist within 10km of the site and the results within the Anabat report (**Appendix 4**) state that this species has **potential** to occur.	The Project may have a significant impact on this potentially occurring species. Therefore a 7-part test of significance (TSC Act) has been applied to this species in **Appendix 1**.
Petaurus australis Yellow-bellied Glider	V	-	Usually associated with tall, mature wet Eucalypt forest. Also known from tall dry open forest and mature woodland. The diverse diet of this species is primarily made up of Eucalypt nectar, sap, honey dew, manna and invertebrates found under decorticating bark and pollen. Tree hollows for nest sites are essential, as are suitable food trees in close proximity. Most records in the Lower Hunter Region occur in the Watagan Mountains and other areas exhibiting significant stands of forest (OEH 2012a).	This species was not detected on site however 232 records exist within 10km of the site. A range of eucalypt species occur on site in which this species could forage. Therefore it is considered as having **potential** to occur.	The Project may have a significant impact on this potentially occurring species. Therefore a 7-part test of significance (TSC Act) has been applied to this species in **Appendix 1**.
Petaurus norfolcensis Squirrel Glider	V	-	Occurs in eucalypt forests and woodlands where it feeds on sap exudates and blossoms. In these areas tree hollows are utilised for nesting sites. This species also requires winter foraging resources when the availability of normal food resources may be limited, such as winter-flowering shrub and small tree species. Widely distributed across the lower hunter region (OEH 2012a).	This species was not detected on site however 88 records exist within 10km of the site. Suitable foraging trees occur in MU 30 and MU 31, as well as shrubs in the dense understory. Therefore, it is considered as having **potential** to occur.	The Project may have a significant impact on this potentially occurring species. Therefore a 7-part test of significance (TSC Act) has been applied to this species in **Appendix 1**.
Petrogale penicillata Brush-tailed Rock-wallaby	E	V	Occurs in forests and woodlands along the Great Divide and on the western slopes in escarpment country with rocky outcrops, steep rocky slopes, gorges, boulders and isolated rocky areas. The majority of populations favour north-facing aspects, but some southern aspects have been recorded. Apart from the critical rock structure *Petrogale penicillata* also requires adjacent vegetation types, associated types include, dense rainforest, wet sclerophyll, vine thicket, dry sclerophyll forest and open forest. They also require suitable caves and rocky overhangs for shelter and also for 'lookout' posts. Records exist from the Watagan Mountains where it is associated with the above habitats (OEH 2012a.	Current surveys did not detect this species on site and only four records exist within 10km of the site. No suitable habitat requirements in the form of rock formations occur on site. Therefore it is considered **unlikely** to occur.	This species was not recorded on site and suboptimal habitat exists on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.

Species/Community	TSC Act	EPBC Act	Habitat Description	Likelihood of Occurrence	Potential Impact
Phascogale tapoatafa Brush-tailed Phascogale	V	-	The Brush-tailed Phascogale is a tree hollow dependant marsupial associated with dry, forested habitats in south-eastern Australia (van der Ree *et al*. 2006) that have a sparse ground cover of herbs, grasses, scleromorphic shrubs or leaf litter (NPWS 1999). However, individuals have also been recorded in heath, swamps, rainforest and wet sclerophyll forest (NPWS 1999). Brush-tailed Phascogales prefer eucalypt woodland with high densities of hollows as a single individual may use up to 20 nesting sites within a single year (Strahan 2004). Nesting sites can include hollow tree limbs, rotten stumps and disused bird nests (Strahan 2004). This largely arboreal species spends the majority of its time in the canopy hunting for insects.	This species was not detected on site however two records exist within 10km of the site. No hollows were noticed on site, and the fragmented nature of the site limits the likelihood of occurrence for this species. It is considered **unlikely** that this species would occur.	This species was not recorded on site and suboptimal habitat exists on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Phascolarctos cinereus Koala (Qld, NSW, Vic and ACT Populations)	V	V	Occurs in forests and woodlands where it requires suitable feed trees (particularly *Eucalyptus* spp.) and habitat linkages. Will occasionally cross open areas, although it becomes more vulnerable to predator attack and road mortality during these excursions. Records from the Lower Hunter Region are largely confined to the greater Port Stephens area, the Lake Macquarie hinterland and the Watagan Mountains, with a small number of records from Cessnock LGA (OEH 2012a).	The site contains a single Schedule 2 Koala feed trees, however the density of this species is less than 15% on site. Only five records exist within 10km of the Site. It is considered **unlikely** to occur.	This species was not recorded on site and suboptimal habitat exists on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Potorous tridactylus tridactylus Long-nosed Potoroo	V	V	Prefers cool rainforest, wet sclerophyll forest and heathland. Sleeps by day in a nest on the ground, and digs for succulent roots, tubers, fungi and subterranean insects. Some diggings seemingly attributable to this species may belong to *Isoodon macrourus* (Northern Brown Bandicoot). Records exist from the Karuah vicinity (Gunninah 1999) and the Gosford LGA (OEH 2012a).	This species was not detected on site and only four records exist within 10km of the site. Although semi-suitable habitat is present on site, this is a cryptic species that occurs in areas of intact vegetation as opposed to fragmented and urbanised areas. Therefore it is considered **unlikely** to occur.	This species was not recorded on site and suboptimal habitat exists on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Pseudonomys novaehollandiae New Holland Mouse	-	V	This species has a patchy distribution within open woodlands, heathlands and in hind dune vegetation throughout Eastern Australia. In the Hunter Region the species stronghold is in the Myall Lakes region.	This species was not detected on or within 10km of the site. Suitable heathland and dune vegetation does not persist on site. Therefore it is considered **unlikely** to occur.	This species was not recorded on site and suboptimal habitat exists on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Pteropus poliocephalus Grey-headed Flying-fox	V	V	This species forages over a large area for nectar/fruits. Seasonally roosts in communal base camps situated within wet sclerophyll forests or rainforests. Frequently observed to forage in flowering Eucalypts. May occur anywhere within the Hunter Region where food or roosting resources are available.	This species was observed flying over the Site during surveys, however, no foraging individuals were detected on Site. Suitable winter and summer flowering foraging tree species occur within the EEC just outside of the Site for this species. Therefore, it is considered as having **potential** to occur.	The Project may have a significant impact on this recorded species. Therefore a 7-part test of significance (TSC Act) has been applied to this species in **Appendix 1**.
Saccolaimus flaviventris Yellow-bellied Sheathtail Bat	V	-	Range of habitats from rainforest to arid shrubland, roosts in tree-hollows. A limited number of records occur on the central coast and the Lower Hunter Region (OEH 2012a).	This species was not recorded on site and only three records exist within 10km of the site. Given the fragmented state of the vegetation on site, and lack of records in the area, it is considered **unlikely** to occur.	This species was not recorded on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.
Scoteanax rueppellii Greater Broad-nosed Bat	V	-	Forages in moister gullies and wet sclerophyll forests as well as in lightly wooded areas and open spaces/ecotones. This species roosts in tree hollows and is relatively widespread within the Lower Hunter Region (OEH 2012a).	Although this species was not recorded on site, 23 records exist within 10km of the site. Areas of MU 42 to the south of the site offer potential habitat for this species. Therefore, it is considered as having **potential** to occur.	The Project may have a significant impact on this potentially occurring species. Therefore a 7-part test of significance (TSC Act) has been applied to this species in **Appendix 1**.
Vespadelus troughtoni Eastern Cave Bat	V	-	A cave dweller, known from wet sclerophyll forest and tropical woodlands from the coast and Dividing Range to the drier forests of the semi-arid zone. It has been found roosting in small groups in sandstone overhangs, in mine tunnels and occasionally in buildings. In all situations, the roost sites are frequently in reasonably well-lit areas. The distribution of this species is largely to the north of the Hunter Region (Strahan 1995).	This species was not recorded on site during field surveys. Habitats within the site are not considered to be suitable for the species and only scattered records for this species exists within the locality. Therefore, it is considered **unlikely** to occur within the disturbance footprints.	This species was not recorded on site and suboptimal habitat exists on site, thus this species is unlikely to be affected by the proposed activities, therefore AoS for this species is not required.

Species/Community	TSC Act	EPBC Act	Habitat Description	Likelihood of Occurrence	Potential Impact
Vegetation Communities					
Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	E	-	This community has an open to dense layer of eucalypts and paperbarks. The dominant trees include *Eucalyptus robusta* (Swamp Mahogany) and *Melaleuca quinquenervia* (Paperbark). Shrub layer includes *Acacia longifolia*, *Dodonaea triquetra*, *Ficus coronata*, *Leptospermum polygalifolium* and Melaleuca species. It is known from the Lake Macquarie LGA. Is associated with humic clay loams and sandy loams on waterlogged or periodically inundated alluvial flats and drainage lines.	The vegetation community MU 42 that occurs to the south of the Site is considered to be **commensurate** with this EEC. This EEC does not occur on the Site, however indirect impacts may occur as a result of the Project.	Although this vegetation community is located with an area not proposed to be directly affected by the Project, the proposed activities may impact on this community. A 7-part test of significance (TSC Act 1995) has been applied to this species in **Appendix 1**.

Key:

V = Vulnerable Species. CE = Critically Endangered Species

E = Endangered Species EEC = Endangered Ecological Community

The following species are being assessed in **Appendix 1** under the 7 Part Test of Significant (TSC Act) based on the results of **Table 11**.

Flora

- *Acacia bynoeana* (Bynoe's Wattle) (TSC Act and EPBC Act)
- *Angophora inopina* (Charmhaven Apple) (TSC Act and EPBC Act)
- *Cryptostylis hunteriana* (Leafless Tongue-orchid) (TSC Act and EPBC Act)
- *Grevillia parviflora* subsp*. parviflora* (Small-flower Grevillea) (TSC Act and EPBC Act)
- *Tetratheca juncea* (Black-eyed Susan) (TSC Act and EPBC Act)

Fauna

- Regent Honeyeater (*Anthochaera phrygia*) (TSC Act and EPBC Act)
- Gang-gang Cockatoo (*Callocephalon fimbriatum*) (TSC Act)
- Glossy Black-Cockatoo (*Calyptorhynchus lathami*) (TSC Act)
- Little Lorikeet (*Glossopsitta pusilla*) (TSC Act)
- Little Eagle (*Hieraaetus morphnoides*) (TSC Act)
- Swift Parrot (*Lathamus discolour*) (TSC Act and EPBC Act)
- Powerful Owl (*Ninox strenua*) (TSC Act)
- Masked Owl (*Tyto novaehollandiae*) (TSC Act)
- Sooty Owl (*Tyto tenebricosa*) (TSC Act)
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*) (TSC Act)
- Golden-tipped Bat (*Kerivoula papuensis*) (TSC Act)
- Little Bentwing-bat (*Miniopterus australis*) (TSC Act)
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*) (TSC Act)
- Eastern Freetail-bat (*Mormopterus norfolkensis*) (TSC Act)
- Southern Myotis (*Myotis macropus*) (TSC Act)
- Yellow-bellied Glider (*Petaurus australis*) (TSC Act)
- Squirrel Glider (*Petaurus norfolcensis*) (TSC Act)
- Grey-headed Flying-fox (*Pteropus poliocephalus*) (TSC Act and EPBC Act)
- Greater Broad-nosed Bat (*Scoteanax rueppellii*) (TSC Act)

Vegetation Communities

- *Swamp Sclerophyll Fore*st on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions (TSC Act).

Assessment under the 7-part test of significance determined that the proposal is unlikely to have a significant impact on threatened species or ecological communities such that a local extinction would occur.

6.0 Matters of National Environmental Significance

An EPBC Act Protected Matters Search was undertaken within the DoE on-line database (accessed May 2014) to generate a list of those Matters of National Environmental Significance (MNES) from within 10 km of the Site. An assessment of those MNES relevant to biodiversity has been undertaken in accordance within *EPBC Act Policy Statement 1.1 Significant Impact Guidelines Matters of National Environmental Significance* (DoE, 2013). The Matters of National Environmental Significance protected under national environment law include:

- Listed threatened species and communities;
- Listed migratory species;
- Ramsar wetlands of international importance;
- Commonwealth marine environment;
- World heritage properties;
- National heritage places;
- The Great Barrier Reef Marine Park;
- Nuclear actions; and
- A water resource, in relation to coal seam gas development and large coal mining development.

6.1.1 Listed Threatened and Migratory Species and Communities

Eight threatened species listed under the EPBC Act 1999 are relevant to the Project due to the presence of suitable habitat or being recorded within the Site (as outlined in **Table 11**). Those terrestrial flora and fauna under consideration based on on-site habitats present are listed as follows:

Flora

- *Acacia bynoeana* (Bynoe's Wattle)
- *Angophora inopina* (Charmhaven Apple)
- *Cryptostylis hunteriana* (Leafless Tongue-orchid)
- *Grevillia parviflora* subsp*. parviflora* (Small-flower Grevillea)
- *Tetratheca juncea* (Black-eyed Susan)

Fauna

- Regent Honeyeater (*Anthochaera phrygia*)
- Swift Parrot (*Lathamus discolour*)
- Grey-headed Flying-fox (*Pteropus poliocephalus*)

Under the TSC Act Assessment of Significance in **Appendix 1** it was concluded that the Project is unlikely to significantly impact the above MNES species.

Table 5 lists the migratory species identified from database searches. No migratory species were recorded on site during surveys. The following species were considered as having potential to occur:

- Great Egret (*Ardea alba*)
- Cattle Egret (*Ardea ibis*)
- White-bellied Sea Eagle (*Haliaeetus leucogaster*)

- White-throated Needletail (*Hirundapus caudacutus*)
- Rainbow Bee-eater (*Merops ornatus*)
- Black-faced Monarch (*Monarcha melanopsis*)
- Spectacled Monarch (*Monarcha trivirgatus*)
- Eastern Curlew (*Numenius madagascariensis*)
- Pacific Golden Plover (*Pluvialis fulva*)
- Rufous Fantail (*Rhipidura rufifrons*)
- Painted Snipe (*Rostratula benghalensis*)

Although these species may occupy and utilise various habitats throughout the Site, no habitat on site is critical to their survival. They are all highly mobile species that could essentially use the surrounding Olney State Forest and private vegetated lands in between. It is unlikely that the proposal over the site will impact upon any occurring or potentially occurring migratory species.

No Endangered Ecological Communities listed under the EPBC Act have been recorded within the Site or have been identified within any areas that have potential to be affected by indirect impacts.

6.1.2 World Heritage Properties:

The Site is not a World Heritage area, and is not in close proximity to any such area.

6.1.3 National Heritage Places:

The Site is not a National Heritage area, and is not in close proximity to any such area.

6.1.4 Wetlands of International Significance (declared Ramsar wetlands);

The Ramsar listed Hunter Estuary Wetland, which comprises Kooragang Nature Reserve and Shortland Wetlands, is located approximately 39 km north east of the Site. The proposed activity of clearing is not expected to have an impact on any connected body of water; therefore the Project will not impact upon the Hunter Estuary Wetland.

6.1.5 Great Barrier Reef Marine Parks:

The Site is not part of or within close proximity to any Great Barrier Reef Marine Park.

6.1.6 Commonwealth Marine Areas:

The Site is not part of or within close proximity to any Commonwealth Marine Area.

6.1.7 Threatened Ecological Communities;

No Threatened Ecological Communities listed under the EPBC Act were found to occur within 10km of the Site.

7.0 Mitigation measures

7.1 Surface Disturbance

The Project involves the potential removal of all habitat situated within the Site, resulting in a loss of 0.89 hectares of native vegetation and the removal of an additional 0.55 hectares of cleared and non native vegetation. Due to the unavoidable impacts of potentially clearing 0.89 hectares of native vegetation, mitigation measures have been developed to minimise the effects of this clearing, and thus potential indirect impacts associated with the Project. **Table 12** provides a summary of the potential impacts as a result of clearing and recommended mitigation measures.

Table 12 Recommended Mitigation measures

Impact	Mitigation Measures
Direct Impacts	
Impacts to flora (loss of species and habitat)	The full extent of any vegetation clearance will be clearly documented and mapped in the site's CEMP. The CEMP will prepared by the construction contractor prior to the commencement of construction.
	Materials, plant and equipment will not be stored within the drip-lines of any trees to be retained within the site.
	To prevent damage to vegetation outside the boundaries of access tracks, vehicles and machinery will be restricted to designated work areas.
	Where access tracks run alongside areas of natural bushland, protective fencing or paraweb (or similar type) fencing is to be installed along the boundaries of the track to prevent vehicles from inadvertently entering/damaging bushland.
	Degradation or disturbance to areas of water front (riparian) vegetation will be avoided to the greatest possible extent. Any such areas will be clearly identified in the CEMP.
	Where excavated soil is to be used in site restoration, it will be excavated and stockpiled in sequential layers corresponding to the existing soil profile. Topsoil and leaf litter is to be removed first and windrowed in separate stockpiles of less than 1m in height on the upslope side of excavations. Soil layers will be replaced sequentially so that the soil profile is restored as closely as possible to its pre-work status.
	All temporary erosion and sediment control devices such as silt-stop fencing will be removed from the site at the completion of the works or when the site is stabilised.
Impacts to fauna (loss of species and habitat)	Where possible, clearing activities will be timed to avoid removal of hollow-bearing trees during breeding season of threatened species.
	Placement of hollow logs and felled hollow-bearing trees within adjacent vegetation to provide additional habitat resources for terrestrial fauna.
	The clearing extents are to be clearly demarcated with temporary fencing before commencement of works.
Indirect Impacts (reduction in quality of habitats)	
Erosion and Sedimentation (further detailed in the EIS (RPS 2014))	Sediment and nutrient controls will be implemented to reduce the impacts of stormwater, erosion and sedimentation on water quality. Specific erosion and sediment controls are to be contained within the site Construction Environment Management Plan (CEMP).
	Installation of erosion and runoff control measures around cleared and operational areas.

Impact	Mitigation Measures
	Clearing of vegetation is not to be undertaken during extensive or heavy rain events.
	Where excavated soil is to be used in site restoration, it will be excavated and stockpiled in sequential layers corresponding to the existing soil profile. Topsoil and leaf litter is to be removed first and windrowed in separate stockpiles. Soil layers will be replaced sequentially so that the soil profile is restored as closely as possible to its pre-work status.
	Sediment filters such as silt fences, coir logs, or turf strips will be located downstream of disturbed areas.
Weed Incursion	The work site will be left clean from debris and other rubbish and in a manner that does not promote the growth of weeds at the end of works.
	Machines, tools and contractors to follow wash down protocols in the CEMP to limit the spread and establishment of weeds on site.

8.0 Conclusion

RPS was engaged by Johnson Property Group to undertake a Flora and Fauna Assessment as part of the Environmental Impact Statement (EIS) to be prepared for the Cooranbong Local Water Centre.

This report was based on desktop research and field surveys conducted by RPS ecologists from May to June 2014. A range of flora and fauna survey techniques were implemented to detect species occurring in the Site in line with the LMCC Flora and Fauna Guidelines (2012).

Flora surveys identified 71 species within the Site which included two threatened species and one Endangered Ecological Community listed under the TSC Act and/or EPBC Act.

A total of 37 fauna species were identified within the Site, including 27 bird species and 10 mammal species. Of these, two species are listed as threatened under the TSC Act.

The likelihood of potential impacts on species listed under the TSC Act and EPBC Act has been considered with regard to the proposed clearing of native vegetation and associated indirect impacts. As a result of all vegetation within the Site potentially being removed, a small amount of habitat for threatened flora and fauna will be lost. However, due to the wider availability of commensurate habitats within the Olney State Forest and Environmental Corridor Areas associated with the North Cooranbong Residential Development, and recommended mitigation measures being employed to ameliorate other direct and indirect impacts, assessments under the TSC Act and regarding MNES concluded that the project is unlikely to have a significant impact on threatened species, populations or EECs.

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Appendix 1

TSC Act 7-Part Test of Significance

TSC Act Assessment of Significance (7-Part Test)

Section 5A of the EP&A Act lists seven factors that must be taken into account in the determination of the significance of potential impacts of proposed activities on 'threatened species, populations or ecological communities or their habitats' (threatened biota) listed under the TSC Act. The '7-part test' is used to determine whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats and thus whether a Species Impact Statement (SIS) is required to be produced.

The significance of the impacts on those threatened species and EECs which have been recorded in the site or are likely to occur and are likely to utilise habitat to be potentially impacted by the proposed activities (see **Table 11**) have been assessed. The following communities and species have been considered:

Fauna

Critically Endangered

- Regent Honeyeater (*Anthochaera phrygia*)

Endangered

- Swift Parrot (*Lathamus discolour*)

Vulnerable

- Gang-gang Cockatoo (*Callocephalon fimbriatum*)
- Glossy Black-Cockatoo (*Calyptorhynchus lathami*)
- Little Lorikeet (*Glossopsitta pusilla*)
- Little Eagle (*Hieraaetus morphnoides*)
- Powerful Owl (*Ninox strenua*)
- Masked Owl (*Tyto novaehollandiae*)
- Sooty Owl (*Tyto tenebricosa*)
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)
- Golden-tipped Bat (*Kerivoula papuensis*)
- Little Bentwing-bat (*Miniopterus australis*)
- Eastern Bentwing-bat (*Miniopterus schreibersii* oceanensis)
- Eastern Freetail-bat (*Mormopterus norfolkensis*)
- Southern Myotis (*Myotis macropus*)
- Yellow-bellied Glider (*Petaurus australis*)
- Squirrel Glider (*Petaurus norfolcensis*)
- Grey-headed Flying-fox (*Pteropus poliocephalus*)
- Greater Broad-nosed Bat (*Scoteanax rueppellii*)

Flora

Endangered

- *Acacia bynoeana* (Bynoe's Wattle)
- *Cryptostylis hunteriana* (Leafless Tongue-orchid)

Vulnerable

- *Angophora inopina* (Charmhaven Apple)
- *Grevillia parviflora* subsp*. parviflora* (Small-flower Grevillea) (TSC Act and EPBC Act)
- *Tetratheca juncea* (Black-eyed Susan)

Threatened Ecological Communities

- Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions.

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

Threatened Flora

- *Acacia bynoeana* (Bynoe's Wattle)

A. bynoeana is a shrub to a metre high, with stiff, shiny leaves 1.5-5 cm long. Flowers from September to March. It is distributed along the east coast of central NSW from the Hunter District south to the Southern highlands and west to the Blue Mountains. Typically occurs on sand or sandy clay substrates, often among rock platforms.

This species was not detected during field work within the Site, despite targeted surveys being performed. This species can however, be difficult to detect amongst other vegetation due to its small stature and unassuming growth form. Therefore, its presence within the Site cannot be completely discounted. As such, the Project will remove potentially occupied habitats. The habitat considered to have the highest potential for this species is in the 0.89 ha of MU 31 Coastal Plains Scribbly Gum Woodland (including the disturbed portion of this MU). Searches were undertaken over the overall Site in May and June 2014, with no individuals recorded. Therefore, if present within this location, the numbers are expected to be low. Additionally, Environmental Corridor Areas encompassing 119.24 ha are being retained in perpetuity as a result of the North Cooranbong Residential Development Project which provides substantial amounts of suitable habitat for this species.

Despite targeted surveys, no individuals were recorded therein. Therefore, the Project is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

- *Angophora inopina* (Charmhaven Apple)

A. inopina is a small to large sized woodland tree reaching heights of around 8 m. In NSW it is endemic to the Central Coast region with a disjunct population occurring at Karuah. It is typically found on deep, white, sandy loam-clay soils on sandstone with substrates that are low in nutrients and periodically inundated. Frequent in dry sclerophylla woodland of Scribbly Gum and Red Bloodwood with some Brown Stringybark and a dense understory.

A total of 22 *Angophora inopina* were detected within the Site. These individuals were located within intact and disturbed areas of MU 31 Coastal Plains Scribbly Gum Woodland. All 22 *A. inopina* are proposed to be removed as a result of the proposed Cooranbong LWC. This represents a decrease of 0.02% of the total population conserved within the North Cooranbong Residential Development lands, where 119.24 ha of Environmental Corridor Areas are being retained in perpetuity that contain an estimated 18, 891 *A. inopina*.

With regard to the above information, the removal of 22 *A. inopina* in the context of the wider population and conserved lands, the Project is considered unlikely to have an adverse effect on the life cycle of *A. inopina* such that a viable local population of the species is likely to be placed at risk of extinction.

- *Cryptostylis hunteriana* (Leafless Tongue-orchid)

A very rare leafless, saprophytic orchid that has a symbiotic relationship with mycorrhizal fungi that provides the plant with its nutrient requirements. This orchid remains underground for the majority of its lifecycle, flowering periodically, when conditions are optimal to reproduce. This species is extremely cryptic as it does not flower every year. This species is known to occur within a range of habitats including woodlands to swamp heaths. Within the Hunter and Lake Macquarie region larger populations have been typically found in woodland dominated by *Eucalyptus racemosa* (Scribbly Gum) and prefer areas with an open grassy understorey. Bell (2001) described three known populations within the Central Coast to occur within very similar habitats to each other, namely MU 30 Coastal Plains Smooth-barked Apple Woodland and MU 31 Coastal Plains Scribbly Gum Woodland. The populations described were from Awaba State Forest at Freemans Waterhole, Vales Point at Wyee and Wyee Road at Wyee. It is therefore reasonable to conclude that the MU 31 Coastal Plains Scribbly Gum Woodland community within the Site provides the highest potential habitat for this species. Targeted surveys occurred in May and June 2014 and were centred on the MU 31 Coastal Plains Scribbly Gum Woodland. This survey period is outside *C. hunteriana*'s flowering period. Only two records are known for *C. hunteriana* within a 10km radius of the Site.

The Project has the potential to reduce the area of occupancy of this species, with the highest likelihood of occurrence within the 0.89 ha of MU 31 Coastal Plains Scribbly Gum Woodland. Due to the relatively small area to be cleared, the large extent of suitable habitat being conserved in the conservation lands of the North Cooranbong Residential Development and the lack of records within 10 km of the Site, it can be considered that the Project is unlikely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

- *Grevillea parviflora* subsp. *parviflora* (Small-flowered Grevillea)

Grevillea parviflora subsp. *parviflora* is endemic to NSW and has a widespread but patchy distribution. It occurs on sandstone in the Sydney region, in Kurri Kurri and Heddon Greta in the Lower Hunter Valley and Awaba on the Central Coast. This species grows in a wide range of habitats from heathy to scrubby woodlands and often along roads in relatively open and disturbed areas with highly infertile soil. It is associated with several different communities and canopy species such as *E. parramattensis*, *A. littoralis* and *E. sclerophylla*.

One single *Grevillea parviflora* subsp. *parviflora* stem was detected within the Site. This individual was located within the disturbed area of MU 31 Coastal Plains Scribbly Gum Woodland. The single *G. parviflora* subsp. *parviflora* is proposed to be removed as a result of the proposed Cooranbong LWC. This individual represents a reduction of 0.001% of the overall population to be conserved within the North Cooranbong Residential Development lands, where119.24 ha of Environmental Corridor Areas are being retained in perpetuity that contain an estimated 53, 455 *G. parviflora* subsp. *parviflora*.

With regard to the above information, the removal of one *G. parviflora* subsp. *parviflora* in the context of the wider population and available conservation lands, the Project is considered unlikely to have an adverse effect on the life cycle of *G. parviflora* subsp. *parviflora* such that a viable local population of the species is likely to be placed at risk of extinction.

- Tetratheca juncea (Black-eyed Susan)

T. juncea is distributed in disjunct populations, generally in coastal districts from about Bulahdelah south to Wyong in the south. Populations were once known from the Port Jackson and Botany Bay areas, although these are now considered extinct (Harden 2002). The predominant populations of *T. juncea* appear to be concentrated within the Lake Macquarie catchment, although recent work around the northern shores of Port Stephens has revealed that substantially sized populations occur in this area, potentially outnumbering the majority of the Lake Macquarie populations. *T. juncea* occurs in sandy heath and dry sclerophyll forests throughout its range.

Suitable habitat for *T. juncea* is present on site within intact and disturbed areas of MU 31 Coastal Plains

Scribbly Gum Woodland. Areas of intact MU 31 Coastal Plains Scribbly Gum Woodland are considered to have higher occupancy potential based on the aspect of the land that is more likely to suit *T. juncea* (South-eastern aspect). Surveys did not detect this species as they were conducted outside this species flowering period. Additional surveys are proposed to be undertaken during the peak flowering period (mid September-mid October) as outlined in the Draft Lake Macquarie *Tetratheca juncea* Planning and Management Guidelines (LMCC 2013). Further information will be produced at the conclusion of the surveys once outcomes have been determined. Nevertheless, with reference to the information available at hand, *T. juncea* is considered as having potential to occur. Considering the wider context of the Site, an estimated 7194 clumps of *T. juncea* are predicted to occur within the Environmental Corridor Areas as part of the approved North Cooranbong Residential Development where 119.24 of suitable habitat for *T. juncea*. Furthermore, the Olney State Forest provides suitable habitat for this species.

In the absence of seasonal field surveys and with regard to the above information, the removal of 0.89 ha of potential habitat in the context of the wider population and available conservation lands, the Project is considered unlikely to have an adverse effect on the life cycle of *T. juncea* such that a viable local population of the species is likely to be placed at risk of extinction.

Threatened Fauna

Woodland/Forest Birds

- Regent Honeyeater (*Anthochaera phrygia*);
- Gang-gang Cockatoo (*Callocephalon fimbriatum*);
- Glossy Black-Cockatoo (*Calyptorhynchus lathami*);
- Little Lorikeet *(Glossopsitta pusill*a);
- Little Eagle (*Hieraaetus morphnoides*);
- Swift Parrot (*Lathamus discolor*);

Neither the Regent Honeyeater nor Swift Parrot were detected within the Site, however the habitat is considered semi-suitable for foraging during winter migration. No preferred foraging tree species were recorded on the Site, however one preferred foraging species, *Eucalyptus robusta*, occurs within MU 42 Red Mahogany Apple Paperbark Forest to the south of the Site. No other species such as *C. maculata*, *E. robusta*, *E. fibrosa* and *E. crebra* were recorded. The surrounding urban and natural environments do support areas of preferred foraging trees for both species. As such, it cannot be ruled out that both species could occupy the site by opportunistically foraging on available resources despite them not being preferred species. The habitat on site is a marginal portion of the available habitat for these species within the area, and no preferred foraging species occur. Thus, it is unlikely that the Project will affect the life cycle of these species such that a viable local population is likely to be placed at risk of extinction.

The Gang-gang Cockatoo in summer is generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In winter, may occur at lower altitudes in drier more open eucalypt forests and woodlands, and often found in urban areas. Whilst potential foraging habitat occurs for this species, was not detected on site. The Site is not considered usual habitat in which this species would utilise and minimal records exist within the wider area. Due to the small area of vegetation to be removed it is unlikely that the Project will affect the life cycle of the Gang-gang Cockatoo such that a viable local population of the species is likely to be placed at risk of extinction.

The Glossy Black-Cockatoo was not detected on site during surveys, however suitable foraging habitat is available on site. Although this species is known to forage primarily on the seeds of Casuarina and Allocasuarina trees, Glossy Black-Cockatoos will occasionally visit eucalypts, angophoras, acacias and hakeas which occur on site. The area to be removed is considered suitable but not preferential for this

species, and large areas of conservation lands are proposed in the northern area of Cooranbong of which this species can utilise. Therefore, it is unlikely that the Project will affect the life cycle of the Glossy Black-Cockatoo such that a viable local population is likely to be placed at risk of extinction.

Little Lorikeets feed on nectar and pollen primarily from flowering eucalypts but also melaleucas and mistletoes. Thus, the Project may affect potential foraging habitat for this species as all three plant types occur on site. Little Lorikeets nest in hollow openings mainly in smooth-barked eucalypts such as *E. viminalis*, *E. blakelyi* and *E. dealbata*. These tree species were not detected across the Site and consequently only marginal breeding habitat occurs for Little Lorikeets on site. Areas of foraging habitat for this species will be conserved in the North Cooranbong Residential Development's Environmental Corridor Areas. Thus, it is unlikely that the Project will affect the life cycle of the Little Lorikeet such that a viable local population is likely to be placed at risk of extinction.

Little Eagles are a medium-sized bird of prey that occupies open eucalypt woodland and forest abundant with suitable prey. This species typically occurs west of the Great Dividing Range however, it has been recorded in some coastal areas of NSW. Habitat on site is not considered suitable for breeding or roosting however foraging habitat is available throughout the vegetation on site. The Project will reduce the availability if potential foraging habitat for this species. Given that this species is highly mobile, and suitable foraging habitat exists in the nearby Olney State Forest and Environmental Corridor Areas, the loss of 1.44 ha of potential foraging habitat for this species is not likely to impact upon this species. Thus, it is unlikely that the Project will affect the life cycle of these species such that a viable local population is likely to be placed at risk of extinction.

Forest Owls

- Powerful Owl (*Ninox strenua*);
- Masked Owl (*Tyto novaehollandiae*); and
- Sooty Owl (*Tyto tenebricosa*).

None of the above species were recorded on site during surveys, however, the Masked Owl was heard calling in the distance during call playback surveys. The Masked and Powerful owl species occur in wet or dry sclerophyll forests and woodlands in the coastal, tablelands and to the western plains of NSW where they hunt for a range of mammalian prey. These species nest in large hollows (preferably Eucalypt trees) where they also roost. Roosting can also occur in dense canopy vegetation, commonly within *S. glomulifera*, *A. littoralis* and *A. melanoxylon*. These owls are specialist predators of arboreal marsupials such as the Common Brushtail Possum, Greater Glider, Sugar Glider and Grey-headed Flying-fox. In addition, some terrestrial mammals commonly taken include the Bush Rat and Brown Antechinus. A high density of small mammals (many of which are hollow-dependent), is required for a suitable foraging habitat for these Forest Owls. The Sooty Owl prefers rainforest habitats with tall dense trees for roosting in. Sooty Owls are a predator of small ground mammals or arboreal mammals such as Common Ringtail Possums and Sugar Gliders.

Common prey-species including Brushtail Possums were detected within the Site during surveys. As no hollows of a suitable size for nesting were recorded, and no rainforest habitat suitable for roosting was recorded, the Project may therefore only impact on potential foraging habitat for the three forest owls within the Site. Due to their widespread distributions and range of habitat utilisation, it is considered unlikely that the Project will affect the life cycle of the Forest Owls such that a viable local population of the species is likely to be placed at risk of extinction.

- Yellow-bellied Glider (*Petaurus australis*)

The Yellow-bellied Glider was not detected during surveys on site. They are distributed along the eastern coast to the western slopes of the Great Dividing Range, occurring in tall mature eucalypt forest in areas of high rainfall. Vegetation habitat types include coastal forests, moist coastal gullies and creek flats, and tall montane forests. They feed on plant residues including nectar, sap, honeydew and manna as well as insects.
The Project will remove potential 0.89 ha of potential foraging habitat for the Yellow-bellied Glider. No individuals were detected on site, no obvious hollows were observed in canopy trees and the availability of habitat suitable for the Yellow-bellied Glider exists within the Olney State Forest and Environmental Corridor Areas. Therefore, it is considered unlikely that the Project will affect the life cycle of the Yellow-bellied Glider such that a viable local population of the species is likely to be placed at risk of extinction.

- Squirrel Glider (*Petaurus norfolcensis*)

The distribution of the Squirrel Glider ranges from western Victoria up to north Queensland mainly inland of the Great Dividing Range. A separate population exists along the coast between southern QLD and southern NSW. The species is widely distributed in the Hunter and Lake Macquarie region and has been recorded in areas surrounding the site. Squirrel Gliders inhabit dry sclerophyll forests, woodlands and swamp forests where it feeds on sap exudates and blossoms. Hollow-bearing trees are used as dens for shelter and breeding and are consequently an essential part of the habitat.

This species was assumed to be present during previous surveys within the site, however it was not recorded during current surveys. Still, its presence cannot be ruled out. Hollow bearing trees may be removed as a result of the development, which is a potential threat to the species, however no obvious hollows were observed on site. Increased fragmentation of existing habitats will be marginally contributed which could place pressure on this species if present. A thin linear fragment of vegetation will remain on private property to the east so movement is not entirely restricted. Notably, 119.24 ha of conservation lands is proposed to the north as a result of the North Cooranbong Residential Development Project, which provides suitable foraging and breeding habitat for the Squirrel glider.

The Project will remove potential 0.89 ha of potential foraging habitat for the Squirrel Glider. No individuals were detected on site, no obvious hollows were observed in canopy trees and the availability of habitat suitable for the Squirrel Glider exists within the Olney State Forest and Environmental Corridor Areas. Therefore, it is considered unlikely that the Project will affect the life cycle of the Squirrel Glider such that a viable local population of the species is likely to be placed at risk of extinction.

- Grey-headed Flying-fox (*Pteropus poliocephalus*)

The Grey-headed Flying-fox is distributed from Melbourne, Victoria up to Bundaberg in Queensland and mainly inhabits sclerophyll forests, woodlands, subtropical and temperate rainforests as wells as heaths and swamps. The selection of habitat is dependent on the availability of foraging opportunities in the form of nectar, pollen and fruits. Common feed trees include *Eucalyptus*, *Melaleuca* and *Banksia*. Grey-headed Flying-foxes are known to migrate long distances in response to foraging availability as nectar and pollen varies over time. Communal roost sites are commonly located in close proximity to a reliable food source and near water bodies, in coastal areas within rainforest patches, mangroves or riparian vegetation.

Grey-headed Flying-foxes were observed flying over the Site during surveys. Foraging habitat is present on site, however permanent roosting habitat is not available. It can therefore be considered that this species only uses the site for foraging on a transient basis. Potential impacts of the Project of this species would therefore be limited to the removal of foraging opportunities. Due to the widespread distribution of potential feed trees within the locality and migration patterns of this species, it is considered unlikely that the Project will affect the life cycle of the Grey-headed Flying-fox such that a viable local population of the species is likely to be placed at risk of extinction.

Cave-roosting bats

- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*); and
- Little Bentwing-bat (*Miniopterus australis*).

Both the Little Bentwing-bat and Eastern Bentwing-bat have a widespread distribution ranging from Cape York to NSW with Eastern Bentwing-bat spreading down to Central Victoria. Large-eared Pied Bat has a more restricted distribution ranging from Shoalwater Bay, QLD south to Ulladulla in NSW, however most of the known distribution of this species occurs in NSW. These insectivorous bats commonly inhabit wet and dry sclerophyll forests as well as rainforests. All species require caves or similar structures with specific characteristics for roosting purposes. Suitable roost sites are not common and should therefore be considered of high conservation significance.

The Little Bentwing-bat was detected on site, while the Eastern Bentwing-bat was not. No caves or suitable artificial structures are present on site for roosting for these species. Little Bentwing-bats have also been recorded roosting in tree hollows, however their choice of roost sites is highly variable with factors relating to microclimate, leaf litter, tree height, hollow entrance and hollow size, amongst others (Richardson 1977). The habitat surrounding the site and within the wider locality contains a range of vegetation types with varying sized tree hollows and artificial structures that would be more suitable in accommodating a colony of these microbat species.

Therefore, it is considered that the Project will not affect the life cycle of the above cave-roosting bats such that a viable local population of the species is likely to be placed at risk of extinction.

Hollow-roosting Bats

- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*);
- Golden-tipped Bat (*Kerivoula papuensis*);
- Eastern Freetail-bat (*Mormopterus norfolkensis*);
- Southern Myotis (*Myotis macropus*); and
- Greater Broad-nosed Bat (*Scoteanax rueppellii*).

All hollow-roosting bats have widespread distributions ranging mainly along coastal areas from southern QLD to Victoria. The Southern Myotis prefers wetland habitat near estuaries and large lakes while all the remaining bats inhabit wet or dry sclerophyll forests, rainforests or woodlands. These species primarily roost in tree hollows but also under decorticating bark and in cracks and fissures. The Southern Myotis roosts in caves, artificial habitats and tree hollows. The Golden-tipped Bat also roosts in abandoned Yellow-throated Scrubwren of Brown Gerygone nests.

Of the above species, the Eastern Freetail Bat was detected on site. The remaining species are considered as having potential to occur at least on an intermittent basis for foraging. Due to the lack of obvious hollows observed on site which may be utilised by a colony of bats, it is unlikely that the sizes of the hollows are large enough to accommodate a roosting colony. The removal of vegetation on site will reduce foraging habitat for the Eastern Freetail Bat as well as potential foraging habitat for the remaining species. However, larger parcels of land exist in the Olney State Forest and Environmental Corridor Areas that could provide the required resources for all the above hollow-roosting bats.

Therefore, it is considered unlikely that the Project will affect the life cycle of the above Hollow-roosting bats such that a viable local population of the species is likely to be placed at risk of extinction.

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

There was no endangered population considered to have a potential of occurring within the Site. Therefore, the above assessment is not applicable.

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

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

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

One Endangered Ecological Community, namely (MU 42 Red Mahogany Apple Paperbark Forest) 'Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions' was recorded and mapped just outside of the Site, but does not occur within the Site. Mitigation measures such as sedimentation and erosion preventions are being implemented to ensure indirect impacts do not encroach into this sensitive riparian area. As such, it is considered that the Project is unlikely to adversely affect or modify this community such that it is placed at risk of extinction.

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

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

Flora

- *Acacia bynoeana* (Bynoe's Wattle)

This species was not detected within the Site. The project will remove approximately 0.89 hectares of potential habitat for this species.

- Cryptostylis hunteriana (Leafless Tongue-orchid)

This species was not detected within the Site. The project will remove approximately 0.89 hectares of potential habitat for this species.

- *Angophora inopina* (Charmhaven Apple)

This species was detected within MU 31 Coastal Plains Scribbly Gum Woodland across the Site. The Project will remove 0.89 ha of suitable habitat as well as 22 individuals of this species.

- *Grevillia parviflora* subsp*. parviflora* (Small-flower Grevillea) (TSC Act and EPBC Act)

This species was detected within the disturbed portion of MU 31 Coastal Plains Scribbly Gum Woodland across the Site. The project will remove 0.89 ha of suitable habitat as well as one individual of this species.

- *Tetratheca juncea* (Black-eyed Susan)

This species was not detected within the Site due to the species flowering period and as such, further surveys are proposed. Approximately 0.89 hectares of potential habitat will be removed from the Site as a result of the proposal.

Fauna

Woodland/Forest Birds

- Regent Honeyeater (*Anthochaera phrygia*);
- Gang-gang Cockatoo (*Callocephalon fimbriatum*);
- Glossy Black-Cockatoo (*Calyptorhynchus lathami*);
- Little Lorikeet *(Glossopsitta pusill*a);
- Little Eagle (*Hieraaetus morphnoides*)
- Swift Parrot (*Lathamus discolor*);

Potential foraging habitat occurs within the site for all Woodland/Forest bird species. Therefore, the project proposes to remove approximately 0.89 hectares of potential habitat for these woodland bird species.

Forest Owls

- Powerful Owl (*Ninox strenua*);
- Masked Owl (*Tyto novaehollandiae*); and
- Sooty Owl (*Tyto tenebricosa*).

Potential foraging habitat exists within the Site for all abovementioned Forest Owl species, mainly within the Woodland communities, but also opportunistically over the cleared areas. As such the project proposes to remove approximately 1.44 ha of potential habitat for these species being 0.89 hectares of vegetation and 0.55 hectares of cleared area.

Mammals

- Yellow-bellied Glider (*Petaurus australis*)

Potential foraging habitat occurs within the site for the Yellow-bellied Glider. Therefore, the project proposes to remove approximately 0.89 ha of potential habitat for this species.

- Squirrel Glider (*Petaurus norfolcensis*)

Potential foraging habitat exists within the Site for Squirrel Gliders, within the Woodland communities. Therefore, the project proposes to remove approximately 0.89 ha of potential habitat for this species.

- Grey-headed Flying-fox (*Pteropus poliocephalus*)

Potential foraging habitat exists within the Site for Grey-headed Flying-foxes, within the Woodland communities. Therefore, the project proposes to remove approximately 0.89 ha of potential habitat for this species.

Cave-roosting bats

- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*); and
- Little Bentwing-bat (*Miniopterus australis*).

Potential foraging habitat occurs across the extent of the Site for both Cave-roosting bats. Therefore, the project proposes to remove approximately 1.44 ha of potential habitat for these species.

Hollow-roosting Bats

- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*);
- Golden-tipped Bat (*Kerivoula papuensis*);
- Eastern Freetail-bat (*Mormopterus norfolkensis*);
- Southern Myotis (*Myotis macropus*); and
- Greater Broad-nosed Bat (*Scoteanax rueppellii*).

The Site provides suitable foraging and breeding habitat for all the Hollow-roosting Bats except the Southern Myotis, which prefers wetland habitats. Therefore, the project proposes to remove approximately 1.44 ha of potential habitat for these species.

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

The removal of 0.89 ha of vegetation on site will marginally isolate vegetation to the south of the site. Minor connectivity still remains to the east on adjacent land holdings.

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

A total 0.89 ha of MU 31 Coastal Plains Scribbly Gum Woodland is being removed as a result of the Project including 0.16 ha of a disturbed portion, along with 0.55 ha of cleared and disturbed lands. Overall, it is considered the removal of vegetated areas and/or modification of cleared areas is not critical to the long-term survival of the species and ecological community assessed in this report. Specifically comment is made below.

Flora

- *Acacia bynoeana* (Bynoe's Wattle)

Habitat for this species on site is not considered important as this species was not detected during surveys. The project proposes to remove 0.89 ha of suitable habitat for this species, however larger more suitable areas of habitat exits in surrounding areas such as the Olney State Forest and Environmental Corridor Areas associated with the North Cooranbong Residential Development Project.

- *Cryptostylis hunteriana* (Leafless Tongue-orchid)

This species was not detected on site however, potential habitat exists within the woodland community. A total of 0.89 ha of potential habitat may be removed as a result of the project for this species, however this small area is not considered important to its survival given the amount of available habitat in the wider area.

- *Angophora inopina* (Charmhaven Apple)

Known habitat on site supports 22 individual *A. inopina*. In the wider context, the North Cooranbong Residential Development's Environmental Corridor Areas are estimated to contain 18,891 individual *A. inopina* and 119.24 ha of suitable habitat. The 0.89 ha of habitat on site is not considered important habitat for the long-term survival of this species.

- *Grevillea parviflora* subsp. *parviflora*

Although this species was detected on site, the habitat supports a significantly small population. An estimated 53,455 individuals are predicted to occur within the North Cooranbong Residential Development's

Environmental Corridor Areas. The 0.89 ha of habitat on site is not considered important habitat for the long-term survival of this species.

- *Tetratheca juncea* (Black-eyed Susan)

This species was not detected on site however, suitable habitat exists within MU 31 Coastal Plains Scribbly Gum Woodland on site. The habitat to be removed is considered potential habitat for this species. An estimated 7,194 clumps of *T. juncea* are predicted to occur within the North Cooranbong Residential Development's Environmental Corridor Areas. The 0.89 ha of habitat on site is not considered important habitat for the long-term survival of this species.

Fauna

Woodland/Forest Birds

- Regent Honeyeater (*Anthochaera phrygia*);
- Gang-gang Cockatoo (*Callocephalon fimbriatum*);
- Glossy Black-Cockatoo (*Calyptorhynchus lathami*);
- Little Lorikeet *(Glossopsitta pusill*a);
- Little Eagle (*Hieraaetus morphnoides*)
- Swift Parrot (*Lathamus discolor*);

The above species were not detected on site during surveys and the surrounding vegetation including Olney State Forest and the Environmental Corridor Areas associated with the North Cooranbong Residential Development offers less disturbed and more suitable habitat for these species. The potential foraging habitat present within the Site is not considered to be significant for the long-term survival of these woodland/forest bird species in the locality.

Forest Owls

- Powerful Owl (*Ninox strenua*);
- Masked Owl (*Tyto novaehollandiae*); and
- Sooty Owl (*Tyto tenebricosa*).

The potential foraging habitat present within the Site is not considered to be significant for the long-term survival of these species in the locality.

Mammals

- Yellow-bellied Glider (*Petaurus australis*)

The potential foraging habitat present within the Site is not considered to be significant for the long-term survival of these species in the locality.

- Squirrel Glider (*Petaurus norfolcensis*)

The potential foraging and/or breeding habitats present within the Site are not considered to be significant for the long-term survival of this species in the locality.

- Grey-headed Flying-fox (*Pteropus poliocephalus*)

The known foraging habitat present within the Site is not considered to be significant for the long-term survival of this species in the locality.

Cave-roosting Bats

- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*); and
- Little Bentwing-bat (*Miniopterus australis*).

The potential foraging habitat present within the site is not considered to be significant for the long-term survival of these species, population or ecological community in the locality.

Hollow-roosting Bats

- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*);
- Golden-tipped Bat (*Kerivoula papuensis*);
- Eastern Freetail-bat (*Mormopterus norfolkensis*);
- Southern Myotis (*Myotis macropus*); and
- Greater Broad-nosed Bat (*Scoteanax rueppellii*).

The potential foraging and/or breeding habitats present within the site are not considered to be significant for the long-term survival of these species, populations or ecological communities in the locality.

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

No areas of critical habitat occur within the site for the species being assessed.

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

Fauna

Of the species being assessed, only a select few have a recovery or threat abatement plan. These species include the following:

Woodland/Forest Birds

- Regent Honeyeater (*Anthochaera phrygia*)
- Swift Parrot (*Lathamus discolor*)

Clearing of vegetation on site is inconsistent with objective 1 in Table 5 (Clearing of native vegetation) of the National Recovery Plan for the Swift Parrot *Lathamus discolour* (Saunders and Tzaros 2011). It is also inconsistent with one specific objective listed under the Regent Honeyeater Recovery plan 1999-2003 (Menkhorst et al. 1999) that states 'maintaining and enhancing the value of Regent Honeyeater habitat at Key sites and throughout their former range...'.

Forest Owls

- Powerful Owl (*Ninox strenua*);
- Masked Owl (*Tyto novaehollandiae*); and
- Sooty Owl (*Tyto tenebricosa*).

The removal of habitat as a result of the Project is inconsistent with objective 5 (minimise loss and fragmentation of owl habitat areas) of the large forest owl recovery plan (DEC 2006).

Mammals

- Yellow-bellied Glider (*Petaurus australis*)

Clearing of vegetation on site is inconsistent with objective 2 (encourage and assist in improving the protection and management of Yellow-bellied Glider and its habitat) of the Recovery plan for the Yellow-bellied Glider (NPWS 2003).

- Grey-headed Flying-fox (*Pteropus poliocephalus*)

The removal of habitat as a result of the Project is inconsistent with objective 1 (to identify and protect foraging habitat) and 2 (to protect and increase the extent of key winter and spring foraging habitat) of the Grey-headed Flying-fox draft recovery plan (DECCW, 2009).

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

The following four KTPs are being contributed to as a result of the Project:

- Anthropogenic Climate Change;
- Clearing of native vegetation;
- Invasion of native plant communities by exotic perennial grasses; and
- Infection of native plants by *Phytophthora cinnamomi*.

These KTPs have been previously addressed in **Section 4.3**.

Appendix 2

Flora Species List

Appendix Key: * = introduced species
(V) = listed as Vulnerable in NSW.
(V*) = Species listed under the Commonwealth EPBC Act as Vulnerable

Family	Scientific Name	Common Name
Fabaceae/faboideae/Mimosoideae	*Acacia longifolia* var. *longifolia*	Sydney Golden Wattle
Fabaceae/faboideae/Mimosoideae	*Acacia implexa*	Hickory Wattle
Casuarinaceae	*Allocasuarina littoralis*	Black She-oak
Poaceae	*Andropogon virginicus**	Whisky Grass
Myrtaceae	***Angophora inopina* (V, V*)**	**Charmhaven Apple**
Poaceae	*Aristida vagans*	Three-awn Speargrass
Asparagaceae	*Asparagus aethiopicus**	Asparagus Fern
Proteaceae	*Banksia oblongifolia*	Fern-leaf Banksia
Proteaceae	*Banksia spinulosa*	Hairpin Banksia
Asteraceae	*Bidens pilosa*	Cobbler's Pegs
Pittosporaceae	*Billardiera scandens*	Appleberry
Myrtaceae	*Callistemon rigidus*	Stiff Bottlebrush
Myrtaceae	*Callistemon salignus*	Willow Bottlebrush
Cupressaceae	*Callitris* spp.	-
Dicksoniaceae	*Calochlaena dubia*	Rainbow Fern
Lauraceae	*Cassytha glabella*	-
Apiaceae	*Centella asiatica*	Swamp Pennywort
Lauraceae	*Cinnamomum camphora**	Camphor Laurel
Vitaceae	*Cissus* spp.	-
Polygalaceae	*Comesperma ericinum*	Pyramid Flower
Asteraceae	*Conyza bonariensis**	Flat-leaf Fleabane
Myrtaceae	*Corymbia gummifera*	Red Bloodwood
Orchidaceae	*Cryptostylis subulata*	Large Tongue Orchid
Phormiaceae	*Dianella caerulea* var. *producta*	Blue Flax Lily
Poaceae	*Echinopogon caespitosus*	Hedgehog Grass
Poaceae	*Entolasia marginata*	Bordered Panic
Poaceae	*Entolasia stricta*	Wiry Panic
Epacridaceae	*Epacris pulchella*	Wallum Heath
Poaceae	*Eragrostis brownii*	Brown's Lovegrass
Myrtaceae	*Eucalyptus capitellata*	Brown Stringybark
Myrtaceae	*Eucalyptus globoidea*	White Stringybark
Myrtaceae	*Eucalyptus haemastoma*	Broad-leaved Scribbly Gum
Cyperaceae	*Gahnia clarkei*	Tall Saw-Sedge
Geraniaceae	*Geranium homeanum*	Northern Cranesbill
Phyllanthaceae	*Glochidion ferdinandi* var. *ferdinandi*	Cheese Tree
Fabaceae/faboideae	*Glycine clandestina*	Twining Glycine
Goodeniaceae	*Goodenia heterophylla*	-
Proteaceae	***Grevillea parviflora* subsp. *parviflora* (V, V*)**	**Small-leaved Grevillea**
Proteaceae	*Hakea sericea*	Needlebush

Family	Scientific Name	Common Name
Asteraceae	*Hypochaeris radicata**	Flatweed
Poaceae	*Imperata cylindrica*	Blady Grass
Proteaceae	*Isopogon anemonifolius*	Flat-leaved Drumsticks
Poaceae	*Joycea pallida*	Silvertop Wallaby Grass
Proteaceae	*Lambertia formosa*	Mountain Devil
Cyperaceae	*Lepidosperma laterale*	Variable Sword-sedge
Myrtaceae	*Leptospermum polygalifolium*	Tantoon
Myrtaceae	*Leptospermum trinervium*	Slender Tea-tree
Epacridaceae	*Leucopogon virgatus*	-
Oleaceae	*Ligustrum lucidum**	Large-leaved Privet
Oleaceae	*Ligustrum sinense**	Small-leaved Privet
Lindsaeaceae	*Lindsaea microphylla*	Lacy Wedge-fern
Arecaceae	*Livistona australis*	Cabbage Palm Tree
Lomandraceae	*Lomandra multiflora* subsp. *multiflora*	Many-flowered Mat-rush
Lomandraceae	*Lomandra obliqua*	Twisted Mat-rush
Celastraceae	*Maytenus silvestris*	Orange Bush
Myrtaceae	*Melaleuca linariifolia*	Snow in Summer
Myrtaceae	*Melaleuca nodosa*	Ball Honey Myrtle
Poaceae	*Microlaena stipoides*	Weeping Grass
Apocynaceae	*Parsonsia straminea*	Common Silkpod
Poaceae	*Paspalum dilatatum**	Paspalum
Proteaceae	*Persoonia levis*	Broad-leaved Geebung
Thymelaeaceae	*Pimelea linifolia*	Slender Rice Flower
Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum
Lobeliaceae	*Pratia purpurascens*	Whiteroot
Dennstaedtiaceae	*Pteridium esculentum*	Bracken Fern
Rosaceae	*Rubus fruticosus* sp. agg.*	Blackberry
Asteraceae	*Senecio madagascariensis**	Fireweed
Poaceae	*Sporobolus creber*	Slender Rat's Tail Grass
Verbenaceae	*Verbena bonariensis**	Purpletop
Violaceae	*Viola hederacea*	Ivy-leaved Violet
Xanthorrhoaceae	*Xanthorrhoea latifolia*	-

Appendix 3

Fauna Species List

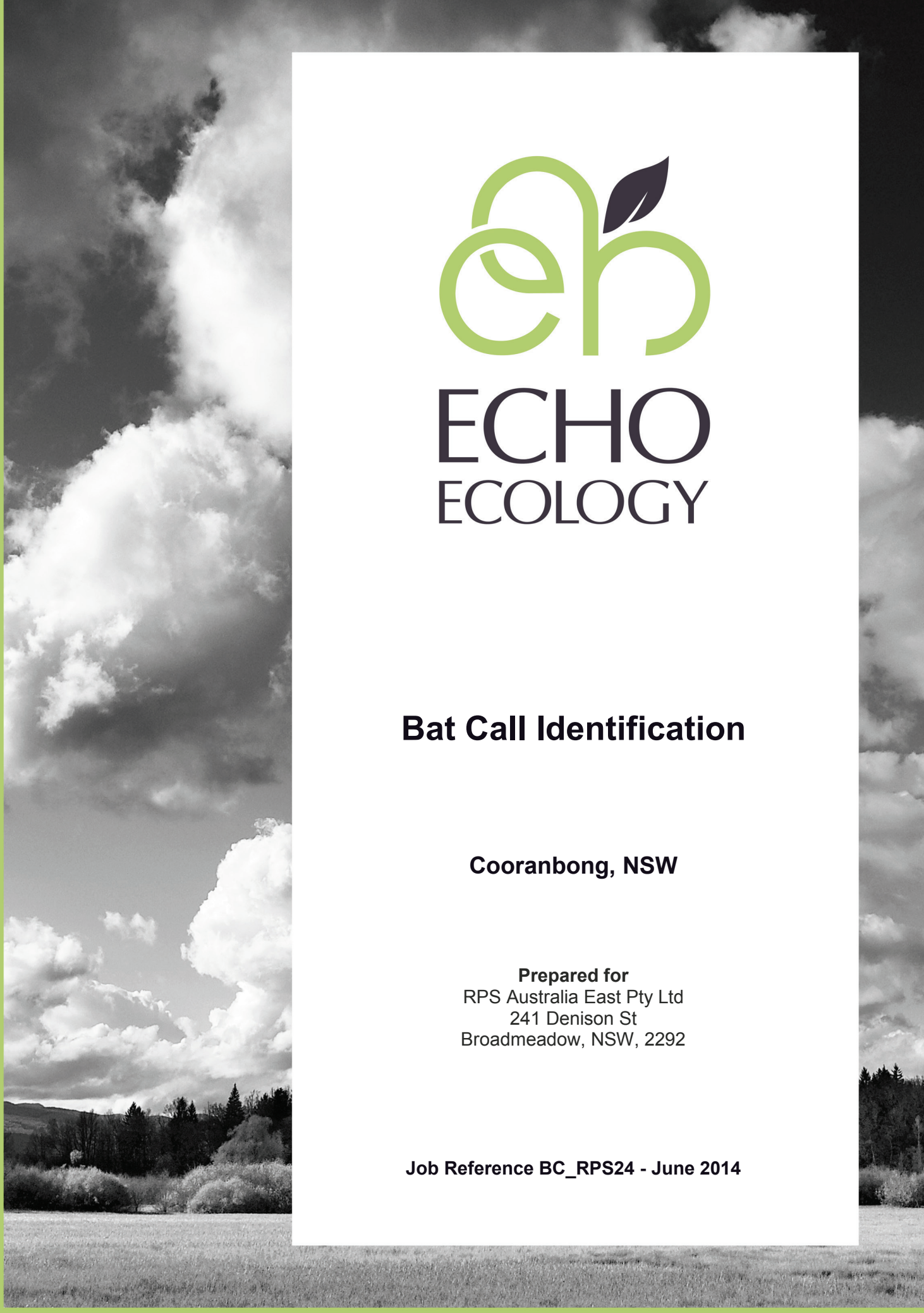
Appendix Key: * = introduced species
(C) = listed as CAMBA species
(J) = listed as JAMBA species
(E) = listed as Endangered in NSW.
(V) = listed as Vulnerable in NSW.
(V*) = Species listed under the Commonwealth EPBC Act as Vulnerable
(E*) = Species listed under the Commonwealth EPBC Act as Endangered
(M) = Species listed under the Commonwealth EPBC Act as Migratory

Family	Scientific Name	Common Name	TSC Act 1995	EPBC Act 1999
Birds				
Columbidae	*Leucosarcia picata*	Wonga Pigeon	-	-
Charadriidae	*Vanellus miles*	Masked Lapwing	-	-
Cacatuidae	*Cacatua galerita*	Sulphur-crested Cockatoo	-	-
	Cacatua sanguinea	Little Corella	-	-
	Eolophus roseicapillus	Galah	-	-
Psittacidae	*Trichoglossus haematodus*	Rainbow Lorikeet	-	-
Alcedinidae	*Dacelo novaeguineae*	Laughing Kookaburra	-	-
Climacteridae	*Cormobates leucophaea*	White-throated Treecreeper	-	-
Maluridae	*Malurus cyaneus*	Superb Fairy-wren	-	-
Acanthizidae	*Acanthiza nana*	Yellow Thornbill	-	
	Acanthiza pusilla	Brown Thornbill	-	-
	Sericornis frontalis	White-browed Scrubwren	-	-
Meliphagidae	*Acanthorhynchus tenuirostris*	Eastern Spinebill	-	-
	Anthochaera carunculata	Red Wattlebird	-	-
	Lichenostomus chrysops	Yellow-faced Honeyeater	-	-
	Manorina melanophrys	Bell Miner	-	-
	Meliphaga lewinii	Lewin's Honeyeater	-	-
Psophodidae	*Psophodes olivaceus*	Eastern Whipbird	-	-
Artamidae	*Cracticus nigrogularis*	Pied Butcherbird	-	-
	Cracticus tibicen	Australian Magpie	-	-
	Cracticus torquatus	Grey Butcherbird	-	-
	Strepera graculina	Pied Currawong	-	-
Rhipiduridae	*Rhipidura albiscapa*	Grey Fantail	-	-
Monarchidae	*Grallina cyanoleuca*	Magpie-lark	-	-
Petroicidae	*Eopsaltria australis*	Eastern Yellow Robin	-	-
Timaliidae	*Zosterops lateralis*	Silvereye	-	-
Estrildidae	*Neochmia temporalis*	Red-browed Finch	-	-
Mammals				
Dasyuridae	*Antechinus stuartii*	Brown Antechinus	-	-

Family	Scientific Name	Common Name	TSC Act 1995	EPBC Act 1999
Phalangeridae	*Trichosurus vulpecula*	Common Brushtail Possum	-	-
Macropodidae	*Macropus rufogriseus*	Red-necked Wallaby	-	-
Molossidae	*Mormopterus norfolkensis*	Eastern Freetail-bat	**V**	-
	Tadarida australis	White-striped Freetail-bat	-	-
Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat	-	-
	Miniopterus australis	Little Bentwing-bat	**V**	-
	Nyctophilus gouldi	Gould's Long-eared Bat	-	-
	Rattus fuscipes	Bush Rat	-	-
	*Rattus rattus**	Black Rat	-	-

Appendix 4

Anabat Report



ECHO ECOLOGY

Bat Call Identification

Cooranbong, NSW

Prepared for
RPS Australia East Pty Ltd
241 Denison St
Broadmeadow, NSW, 2292

Job Reference BC_RPS24 - June 2014

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This report has been prepared to document the analysis of digital ultrasonic bat echolocation calls received from a third party. The data was not collected by the author and as such no responsibility is taken for the quality of data collection or for the suitability of its subsequent use.

This report was authored by

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1.0 INTRODUCTION

This report has been commissioned by RPS Australia East Pty Ltd to analyse bat echolocation call data (Anabat, Titley Electronics) collected from Cooranbong, NSW. Data was provided electronically to the author. This report documents the methods involved in analysing bat call data and the results obtained only.

2.0 METHODS

The identification of bat echolocation calls recorded during surveys was undertaken using AnalookW (Version 4.0r) software. The identification of calls was undertaken with reference to Pennay and others (2004) and through the comparison of recorded reference calls from the Sydney Basin. Reference calls were obtained from the NSW database and from the authors personal collection.

Each call sequence ('pass') was assigned to one of five categories, according to the confidence with which an identification could be made, being:

- Definite - Pass identified to species level and could not be confused with another species
- Probable - Pass identified to species level and there is a low chance of confusion with another species
- Possible - Pass identified to species level but short duration or poor quality of the pass increases the chance of confusion with another species
- Species group - Pass could not be identified to species level and could belong to one of two or more species. Occurs more frequently when passes are short or of poor quality
- Unknown - Either background 'noise' files or passes by bats which are too short and/or of poor quality to confidently identify.

Call sequences that were less than three pulses in length were not analysed and were assigned to 'Unknown' and only search phase calls were analysed. Furthermore, some species are difficult to differentiate using bat call analysis due to overlapping call frequencies and similar shape of plotted calls and in these cases calls were assigned to species groups.

The total number of passes (call sequences) per unit per night was tallied to give an index of activity.

It should be noted that the activity levels recorded at different sites may not be readily able to be compared. Such comparisons are dependent on many variables which need to be carefully controlled during data collection and statistically analysed. Influential variables include wind, rain, temperature, duration of recording, season, detector and microphone sensitivity, detector placement, weather protection devices etc.

2.1 Characteristics Used to Differentiate Species

Miniopterus australis was differentiated from *Vespadelus pumilus*, by characteristic frequency or the presence of a down-sweeping tail on pulses.

Calls from *Mormopterus* sp. were differentiated by the presence of mainly flat pulses. *Mormopterus norfolkensis* was differentiated from *Mormopterus* species 2 in long call sequences where pulses alternated, often with a downward sloping tail.

Chalinolobus gouldii was differentiated from other species by the presence of curved, alternating call pulses.

Myotis macropus, *Nyctophilus geoffroyi* and *Nyctophilus gouldi* were unable to be differentiated based on the calls recorded.

Chalinolobus morio calls were differentiated from those of *Vespadelus* sp. by the presence of a down-sweeping tail on the majority of pulses.

Tadarida australis was differentiated from other bat species on the basis of characteristic frequency.

3.0 RESULTS

A total of 128 call sequences were recorded, of which 18 call sequences were able to be analysed (ie were not 'noise' files or bat calls of short length). Of the bat calls, five call sequences (28 %) were able to be confidently identified (those classified as either definite or probable identifications) to species level (Table 3-1). Species recorded confidently within the site include:

- *Chalinolobus gouldii* (Gould's wattled bat)
- *Miniopterus australis* (Little bentwing bat)
- *Mormopterus norfolkensis* (East-coast freetail bat)
- *Tadarida australis* (White-striped freetail bat)

Additionally, the following bat species potentially occurred within the site, but could not be confidently identified (those calls classified as possible or as a species group):

- *Chalinolobus morio* (Chocolate wattled bat)
- *Mormopterus* species 2 (Eastern freetail bat)
- *Myotis macropus* (Large-footed myotis)
- *Nyctophilus geoffroyi* (Lesser long-eared bat)
- *Nyctophilus gouldi* (Gould's long-eared bat)
- *Vespadelus pumilus* (Eastern forest bat)
- *Vespadelus troughtoni* (Eastern cave bat)
- *Vespadelus vulturnus* (Little forest bat)

It should be noted that additional bat species may be present within the site but were not recorded by the detectors and habitat assessment should be used in conjunction with these results to determine the likelihood of occurrence of other bat species.

Table 3-1 below summarises the results of the bat call analysis.

Table 3-1: Results of bat call analysis (number of passes per site per night)

IDENTIFICATION	Anabat 1 2/06/2014	Anabat 1 3/06/2014	Anabat 1 4/06/2014	Anabat 1 5/06/2014
DEFINITE				
Miniopterus australis	1	-	-	-
Tadarida australis	-	2	-	-
PROBABLE				
Chalinolobus gouldii	-	-	1	-
Mormopterus norfolkensis	1	-	-	-
POSSIBLE				
Chalinolobus morio	-	1	-	-
SPECIES GROUPS				
Chalinolobus gouldii / Mormopterus norfolkensis / Mormopterus species 2	-	-	2	-
Chalinolobus morio / Vespadelus pumilus / Vespadelus vulturnus / Vespadelus troughtoni	1	1	-	-
Miniopterus australis / Vespadelus pumilus	1	-	4	-
Myotis macropus / Nyctophilus geoffroyi / Nyctophilus gouldi	2	1	-	-
UNKNOWN				
'Noise' files	3	6	17	70
Unknown	8	1	4	1
TOTAL	**17**	**12**	**28**	**71**

4.0 SAMPLE CALLS

A sample of the calls actually identified from the site for each species is given below.

Figure 4-1: *Chalinolobus gouldii* probable call

Figure 4-2: *Miniopterus australis* definite call

Figure 4-3: *Mormopterus norfolkensis* probable call

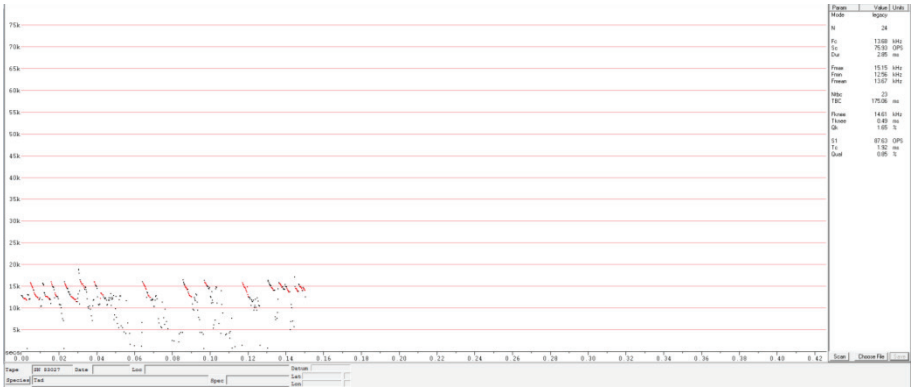

Figure 4-4: *Tadarida australis* definite call

5.0 REFERENCES

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Appendix 5

Staff Qualifications

Curriculum Vitae

MATTHEW DOHERTY

Technical Director (Ecology)

Bachelor of Landscape Management and Conservation (Land & Water Conservation Major), University of Western Sydney.

Bushland Regeneration Certificate II, Western Sydney Institute of TAFE.

AREAS OF EXPERTISE:

Matt has over 13 years experience years experience in the environmental industry with key skills in project management, survey design, GIS and client relations. Matt's background in local government, state government and private consultancy gives him a high level of appreciation of the environmental and consultancy sector, thus allowing him to take a pragmatic approach to providing balanced outcomes against the legislative and policy framework whilst meeting the aims and objectives of clients and determining authorities.

In his position as Technical Director (Ecology), Matt manages the environment department with extensive input on land development, energy and resources projects. Additionally Matt provides advices and assessment relating to bushfire within NSW. He has experience in conducting comprehensive ecological surveys and preparing associated reporting and advices across a broad range of environs throughout New South Wales, with the majority of projects located in the greater Hunter, Central Coast, Blue Mountains, New England, Mid-West including Gunnedah/ Narrabri and Forster / Great Lakes regions. Matt has also undertaken environmental projects in Queensland, South Australia, ACT and Victoria.

SELECTED PROJECT EXPERIENCE:

Energy

- **Santos** – Ecological Project Manager for consultancy works to Santos within the Gunnedah Basin covering gas exploration and ancillary activities. Works include field survey, preparation of advices, impact assessments, EPBC referrals, preparation and implementation of well lease rehabilitation plans, liaison and negotiations with regulators and agencies.
- **Cyndonia Resources / Red Sky Energy** – Project Management and preparation for ecological surveys and impact assessment to inform gas exploration in Northern NSW.
- **Surat Gas Pipeline** – Project Manager and field team leader for the terrestrial fauna survey, impact assessment and reporting component of a proposed 630km gas pipeline alignment between Dalby (east Surat Gas Basin) in southern Queensland to Gladstone on the Central Queensland Coast.
- **EPIC Energy QSN3 Gas Pipeline** – Project Manager for the flora, fauna and habitat survey along with subsequent impact assessment and reporting for an expansion of easement width along the 935km pipeline alignment. The alignment traversed three bioregions from Roma in Queensland to Moomba in South Australia.
- **Queensland Hunter Gas Pipeline** – Ecological input, reporting, GIS analysis and mapping for input to the NSW route alignment (630km) and final revised impact assessment.
- **Hunter Gas Pipeline** – Input into the environmental management plan for implementation across the pipeline alignment.

Resources

- **Centennial Coal** – Project Management, ecological survey, advices and impact assessment reporting to inform Coal Options study including washery expansion, waste emplacement and rail siding upgrade.
- **Xstrata Bulga Coal (surface and underground operations)** – Ecological Project Management for due diligence surveys, annual monitoring surveys and preparation of advices and reporting.
- **Cockatoo Coal** – Project Manager for ecological due diligence works for coal exploration relating to a start up coal mine in the NSW Bylong Valley.
- **Donaldson Coal Mine** – Preparation of GIS database and mapping to support mine community engagement initiatives. These works also involved presentations to the Donaldson Trust.
- **Karuah Quarries** – Project Management, field surveys and annual ecological monitoring.
- **Wild Quarries** – Project Management and reporting of ecological field survey and impact assessment for start up hard rock quarry in the Upper Hunter.

Infrastructure

- **Transgrid** – Ecological survey, targeted threatened species surveys and reporting for establishment of new powerline easements and/or powerline maintenance across the Lower Hunter and Lake Macquarie region.
- **Glendale Interchange** – Project Management, site investigations and ecological constraints and opportunities reporting for a proposed interchange on behalf of Lake Macquarie City Council.
- **Water & Sewer Mains** – Environmental field surveys and preparation of REF documentation to inform applications for the construction of water and sewer pipelines required to service urban expansion and land development projects.

Land Development

- **Coal and Allied Lower Hunter Lands** – Project Manager for the preparation of a detailed Part 3A ecological inventory and impact assessment for a proposed residential subdivision. This involved extensive flora, fauna and habitat surveys over approximately 3,800 hectares. Ongoing liaison, negotiations and presentations were made to authorities and community forums. The project involved significant offsets that helped to secure regional corridors and conservation initiatives long sought after in the region.
- **Rose Group** – Project Manager for the preparation of detailed Part 3A ecological impact assessment for a proposed residential development over two sites in Catherine Hill Bay and Gwandalan. The project also involved negotiating approval under the EPBC Act including preparation Preliminary Information.
- **Landcom North Tuncurry** – Project Manager for bushfire and ecological investigations to inform the North Tuncurry Development Project area. This project involved detailed investigations into critically endangered species and offsets under State and Commonwealth policy.
- **Huntlee** – Project Management and ecology works to inform Major Project Approval and negotiations under the EPBC Act. This project involved critically endangered species, offsets and presentations to stakeholder groups.
- **Hunter Economic Zone Industrial Estate –** Ecological, Bushfire and GIS consultancy works for development investigations within the Hunter Economic Zone industrial estate at Kurri Kurri, to be the largest industrial estate in NSW.

PREVIOUS EXPERIENCE:

Ecologist – Andrews Neil Pty Ltd **2004 - 2005**

Environmental Project Officer / Horticultural Services – Gosford City Council **2003 – 2004**

Environmental Officer - Dept of Land & Water Conservation, Newcastle	**1999**
Volunteer – Maitland City Council	**07/1999 – 12/1999**
Volunteer – Brisbane Waters & Gosford Lagoons Catchment Management Committee	**03/1998 – 05/1998**

MEMBERSHIPS & ACHIEVEMENTS:

- NSW Animal Ethics Research Authority
- NPWS Scientific Investigation Licence (SL100536)
- Senior First Aid
- 4x4 Operation and Handling
- Fire Protection Association Australia (FPAA)
- OH&S Induction Training (White Card)
- Spikeless Tree Climbing Techniques, Total Height Safety
- Landscape Function Analysis Training
- Snake Awareness and Handling Training

Curriculum Vitae

LAUREN VANDERWYK

Ecologist

Newcastle, NSW

Bachelor of Science, University of Newcastle

AREAS OF EXPERTISE:

During the six years Lauren has been working as an Ecologist, she has gained broad range of ecological field experience and experience in Ecological Assessment and management reporting in accordance with relevant State and Commonwealth government legislative frameworks. In addition, Lauren has developed numerous Bushfire Threat Assessments informed by field surveys and desktop assessments in accordance with Planning for Bushfire Purposes (2006). Her experience within the consulting industry has primarily included a wide range of flora and fauna assessment disciplines as required by a wide range of public and private clients including Centennial Coal, Santos and NSW Roads and Maritime Services. Lauren's knowledge of the Central Coast, Hunter, Greater Lithgow and Liverpool Plains regions has expanded extensively since the commencement of her career.

SELECTED PROJECT EXPERIENCE:

Environment

- Flora and fauna identification and habitat assessment
- Targeted threatened flora and fauna surveys
- Delineation and mapping of vegetation communities
- Endangered Ecological Community (EEC) assessment
- Conducting Field Surveys for Flora, Fauna and Habitat Identification
- Report Preparation including Fauna & Flora Assessments
- Ecological Monitoring and Reporting
- Bushfire Threat Assessment & Management reporting
- Understanding of environmental legislation.

Ecology

- **Coal Services Conveyor Belt Upgrade (Springvale Coal Services)** – Initial baseline surveys were undertaken by Lauren including delinitation of vegetation communities, fauna presence and plant diversity. These surveys informed the production of the Baseline Flora and Fauna Report
- **Neubeck Open Cut Coal Mine (Centennial Coal)** – Flora and fauna field surveys over a three year period and the production of the Flora and Fauna Assessment as part of an overiding Environmental Impact Statement were undertaken for the proposed Neubeck open cut coal mine
- **Angus Place and Springvale Underground Longwall Mines (Centennial Coal)** – Ecological surveys were undertaken over a period of 1.5 years to aid in the production of a Flora and Fauna Report for both the Anug Place and Springvale underground mines
- **Airly Coal Mine Flora and Fauna Surveys (Centennial Coal)** – A range of flora and fauna surveys were undertaken to inform both the Airly Baseline Survey Report and the Airly Flora and Fauna Report
- **Lidsdale Siding Biodiversity Management Plan (Centennial Ivanhoe)**– Ecological assessments primarliy undertaken for Lidsdale Siding Flora and Fauna Report informed the production of the Lidsdale Siding

Biodiversity Management Plan, both of which Lauren was involved in. The BMP outlined areas of ecological importance and ecological issues on site with associated management actions

- **Small Lot Housing Development (SNL)** – Flora and fauna surveys were undertaken to inform the Ecological Assessment of a site at Jewells for a small lot housing development
- **Coal Seam Gas Exploration (Santos)**- On site supervisor for coal seam gas exploration in the Gunnedah region. Lauren ensured that all contractors and staff on site complied with the Review of Environmental Factors with environmental protection a prioirty
- **Compensatory Habitat Management Plan (Centennial Coal Charbon)**– Field surveys identifying management issues for the development of a Compensatory Habitat Management Plan at Charbon Colliery. These results informed the production of the Management Plan of which Lauren was involved
- **Industrial Development (Morisset)** – Flora and fauna surveys to produce an Ecological Assessment and Bushfire Threat Assessment

Bushfire

- **Bushfire Threat Assessment (SNL)** – Field and desktop assessments for a small lot housing development at Mount Hutton in relation to bushfire hazards. These assessments formed the production of the Bushfire Threat Assessment fot the site
- **Bushfire Threat Assessment (SNL)** - Field and desktop assessments for a small lot housing development at Jewells in relation to bushfire hazards. These assessments formed the production of the Bushfire Threat Assessment fot the site
- **Bushfire Threat Assessment Update (RSL Lifecare)** – On site and desktop assessments in relation to bushfire hazards for additions to an existing retirement village in hawksnest. These assessments formed the production of the Bushfire Threat Assessment for the site

PREVIOUS EXPERIENCE:

Environmental Scientist - Ecobiological **(2011)**
Primary roles included bush regeneration and the identification of a wide range of native and non-native plant species for rehabilitation of various sites. Some ecological surveys and Ecological Assessment reporting was carried out during her time with Ecobiological.

Trainee Ecologist - Pygmy Possum Ecological Consulting **(2008-2010)**
Undertaking ecological field surveys was the primary role at Pygmy Possum Ecological Consulting. Fauna surveys were carried out across the Central Coast, Lake Macquarie and into the Hunter region. Basic reporting and data entry were undertaken throughout Lauren's time with Pygmy Possum Ecological Consulting

VOLUNTEER EXPERIENCE:

- Regent Honeyeater habitat restoration in the Capertee region with Birdlife Australia (2012);
- Biodiversity research for independent researchers and Australian Geographic in East Kimberley (2011);
- Amphibian (*Litoria subglandulosa* and *Mixophyes balbus*) research at the New England Tablelands with Simon Clulow, Carl Gerhardt and Marion Anstis (2010);
- Bandicoot Research in Manly with the Australian Wildlife Conservancy (2010);
- Microbat dietary surveys and tracking at Empire Bay with Leroy Gonsalves (2010);
- Green and Golden Bell frog research at the Sydney Olympic Park (2010);
- Bush regeneration at Wamberal Lagoon Nature Reserve with National Parks and Wildlife Services primarily restoring Littoral Rainforest (EEC) (2007-2010);

- Fauna research including pit trapping, Elliot trapping, triangulation (for amphibians) and spotlighting for the Watagans fauna database (2007); and
- Bush-stone Curlew surveys at Empire Bay on the Central Coast undertaking call play back methods (2010).

MEMBERSHIPS & ACHIEVEMENTS:

- NSW Driver's Licence (Class C)
- OH&S Induction Training (White Card)
- 4WD course
- ChemCert II certification
- Landscape Function Analysis Training
- Member of the Ecological Society of Australia (ESA)
- Member of Birdlife Australia
- Member of the Australian Mammal Society (AMS)

CONFERENCES:

- Australasian Raptor Conference, Adelaide SA (Attendee) 2013
- National Koala Conference, Port Macquarie NSW (Attendee) 2013
- Society for Conservation Biology Conference - Oceania, Darwin NT (Attendee) 2012

Curriculum Vitae

ARNE BISHOP

Senior Ecologist

Newcastle, NSW

Bachelor of Environmental Science, University of Canberra, 2009

Bachelor of Landscape Architecture, University of Canberra, 2009

Cert IV Horticulture (Landscape) Canberra Institute of Technology, 2003

Cert III Horticulture (Landscape), Canberra Institute of Technology, 2002

Cert II Australian Land Conservation and Restoration, Conservation Volunteers Australia, 2001

NSW Driver's Licence (Class C)

AREAS OF EXPERTISE:

Arne began paid employment in environmental management as a part time field assistant for Alison Rowell Environmental Consultancy in 1999. This role included working on flora and fauna surveys, and habitat/vegetation assessment and mapping. The knowledge and experience Arne gained from this role progressed and developed into a sub-consultancy role with full time employment over spring- summer every year.

In 2001 Arne completed a six month environmental traineeship with Green Corps. This course involved learning about environmental issues and how best to manage them in a practical sense. Arne performed duties such as: pest and weed identification and control; bush regeneration; and natural area restoration.

In addition to the above, Arne has also completed several contracts as an environmental consultant for Eco Logical Australia, assisting with threatened species identification and monitoring on a range of projects. Arne has been employed full-time with RPS at their Newcastle office since January 2011 and quickly progressed from a Field Ecologist role to an Ecologist position. All of these roles have been focused on collating and interpreting scientific information in order to produce recommendations on and resolutions to environmental issues.

SELECTED PROJECT EXPERIENCE

- **Bulga Mine Annual Fauna Monitoring**
  Conducted annual monitoring program that spans two operations and involves seasonal bird surveys, habitat assessments, and the full spectrum of fauna monitoring methodologies, provided technical input and document review
- **Gunnedah Basin**
  Conducted ecological works for Santos within the Gunnedah Basin covering gas exploration and ancillary activities. Works included field survey, preparation of advice, impact assessments, EPBC referrals, preparation and implementation of well lease rehabilitation plans, liaison and negotiations with regulators and agencies
- **Airly Coal Mine Flora and Fauna Surveys (Centennial Coal)**
  A range of flora and fauna surveys were undertaken to inform both the Airly Baseline Survey Report and the Airly Flora and Fauna Report
- **Centennial Coal Angus Place and Springvale Extension Projects**
  Ecological surveys were undertaken over a period of 1.5 years to aid in the production of a Flora and Fauna Report for both the Angus Place and Springvale underground mines Extensive flora and fauna field surveys.
- **Mandalong South Powerline Relocation Flora and Fauna Impact Assessment**
  Conducted targeted threatened species surveys, client liaison, report development.
- **Beltana (Bulga) Underground Mine Bat Impact Assessment and Monitoring**

Conducted extensive fieldwork to identify potential habitat, assessed habitat using night vision technology and developed report.

- **Subdivision and Urban Development at Hills Plain, Tamworth, NSW (Marloelle)**
  Conducted detailed floristic surveys to determine the condition and extent of the EPBC Act Critically Endangered Ecological Community - White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box-Gum Woodland).

PREVIOUS EXPERIENCE:

Ecologist – RPS Australia East Pty Ltd. **2011 - Current**
This role included working on flora and fauna surveys, and habitat/vegetation assessment and mapping.

Part-time field assistant/consultant – Alison Rowell **1999 - 2010**
This role included working on flora and fauna surveys, and habitat/vegetation assessment and mapping. The knowledge and experience I have gained from this role has progressed and developed into a sub-consultancy role with full time employment over spring- summer every year.

Environmental consultancy work - Eco Logical Australia **2008 - 10**
Arne completed several contracts as an environmental consultant for Eco Logical Australia, assisting with threatened species identification and monitoring on a range of projects.

Green Corps Traineeship - Conservation Volunteers Australian (CVA) **2001**
Arne received accredited practical and theoretical training in; First Aid (Level 2, St Johns); Occupational Health and Safety and Environmental Concepts. This training contributed to Certificate II in Australian Land Conservation and Restoration.

MEMBERSHIPS & ACHIEVEMENTS:

Award of Excellence for first place in Conservation Biology and Genetics - University of Canberra.

Landscape Functional Analysis Training

NSW Driver's Licence (Class C)

OH&S Induction Training (White Card)

First Aid Certification

Four Wheel Drive Training and Certification - Out of Town Four Wheel Drive.

Snake and Spider Safety Awareness for Employees (SSSafe) Training

Royal Zoological Society NSW - Membership

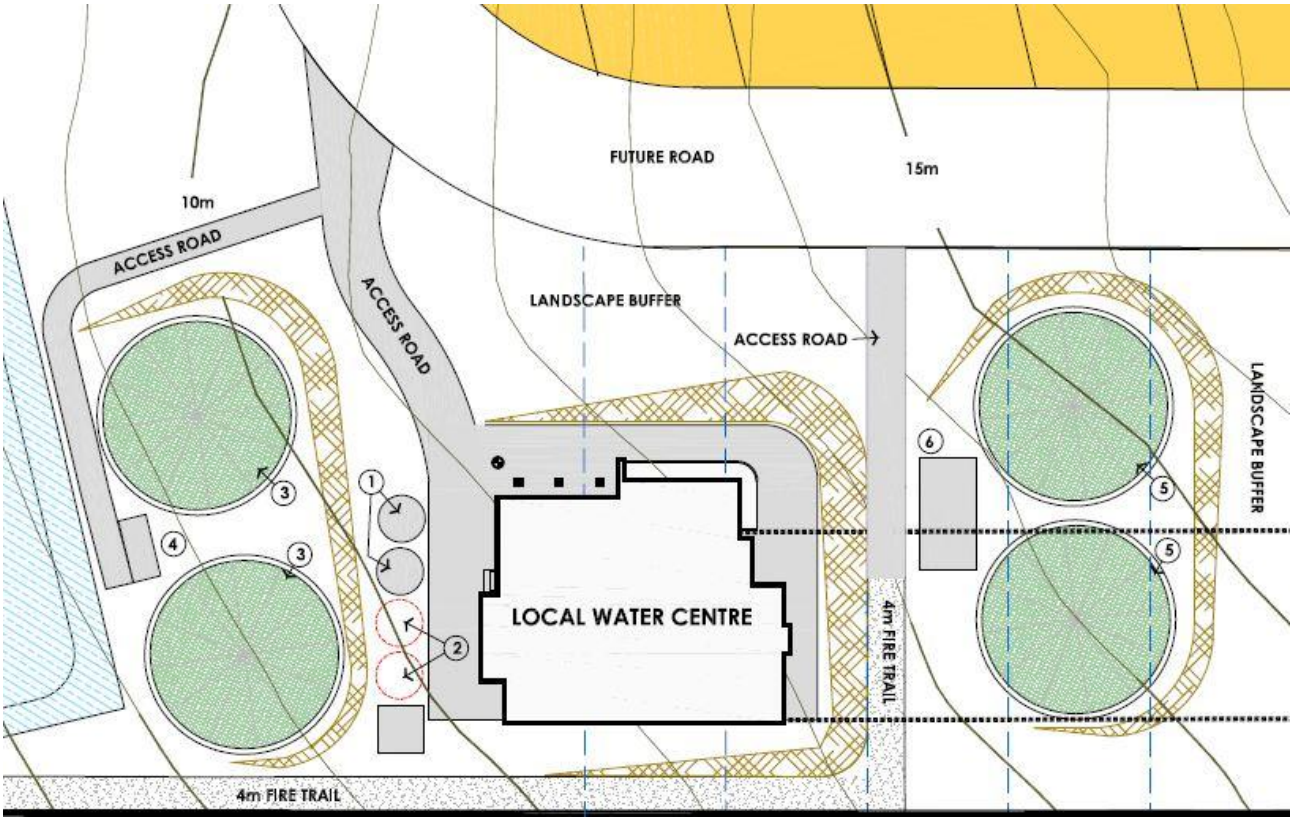
Ecological Consultants Association - Membership

Birds Australia membership

Appendix 6

Site Concept Plan

Cooranbong LWC – Concept Plan



Appendix 5

Cultural Heritage Due Diligence Assessment

Heritage Due Diligence Assessment

For Cooranbong Local Water Centre, Cooranbong NSW

Visual Inspection Date: Wednesday 16 April 2014

Prepared by:

RPS AUSTRALIA EAST PTY LTD

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Client Manager: Robert Dwyer
Report Number: PR122011-1
Version / Date: Final June 2014

Prepared for:

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IMPORTANT NOTE

We have prepared this report for the sole purposes of Cooranbong Water a wholly owned subsidiary of Flow Systems Pty Ltd ("**Client**") for the specific purpose of only for which it is supplied ("**Purpose**"). This report is strictly limited to the purpose and the facts and matters stated in it; it does not apply directly or indirectly and will not be used for any other application, purpose, use or matter.

In preparing this report we have made certain assumptions. We have assumed that all information and documents provided to us by the Client or as a result of a specific request or enquiry were complete, accurate and up-to-date. Where we have obtained information from a government register or database, we have assumed that the information is accurate. Where an assumption has been made, we have not made any independent investigations with respect to the matters the subject of that assumption. We are not aware of any reason why any of the assumptions are incorrect.

Document Status

Version	Purpose of Document	Orig	Review	Review Date	Approval for Issue	Date Issued
Draft A	Client Review	P. Sokol	T.Boer-Mah	28.5.2014	T.Boer-Mah	28.5.2014
Final	Final	P. Sokol	T.Boer-Mah	4.6.2014	T.Boer-Mah	4.6.2014

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Executive Summary

RPS has been engaged by Cooranbong Water (a wholly owned subsidiary of Flow Systems Pty Ltd) to prepare a Heritage Due Diligence Assessment for the proposed construction and operation of a Local Water Centre (Cooranbong LWC) on a portion of land at 617 Freemans Drive, Cooranbong, Lake Macquarie Local Government Area (LGA).

This assessment has been undertaken in accordance with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects* (DECCW 2010) which requires reasonable and practicable steps be taken to: identify whether or not Aboriginal objects are, or are likely to be, present in an area; determine whether or not their activities are likely to harm Aboriginal objects (if present); and determine if an Aboriginal Heritage Impact Permit (AHIP) is required (DECCW 2010:2).

A search of the AHIMS database was undertaken for a 10 kilometre radius surrounding the Project Area. A total of 24 Aboriginal sites were identified in the search. No Aboriginal sites were identified in the Project Area. The closest recorded AHIMS site to the area is AHIMS#45-3-3274, an isolated artefact, which is approximately two kilometres to the south west and is situated outside the LWC site (Project Area).

A search of the relevant historic/non-Indigenous heritage databases were also undertaken, but no heritage items identified in the Project Area.

The visual inspection of the Project Area was conducted on Wednesday 16 April 2014 by RPS Cultural Heritage Consultant Philippa Sokol. The area was vegetated and partially cleared and had been subject to high levels of disturbance associated with dirt access tracks crossing the area, previous clearing, vehicle use in cleared areas, fencing, accumulated debris and erosion.

No Aboriginal objects or places were identified within the LWC Site (Project Area) and therefore an Aboriginal Heritage Impact Permit (AHIP) is not required for the proposed activity. There are no non-Indigenous heritage items identified in the Project Area.

The following recommendations are made in relation to the proposed activity:

Recommendation 1

All relevant Cooranbong Water staff and contractors should be made aware of their statutory obligations for heritage under the *National Parks and Wildlife Act* 1974 and the *Heritage Act* 1977, which may be implemented as a heritage induction.

Recommendation 2

This due diligence assessment must be kept by Cooranbong Water so that it can be presented, if needed, as a defence from prosecution under Section 86(2) of the *National Parks and Wildlife Act* 1974.

Recommendation 3

If unrecorded Aboriginal object/s are identified in the LWC Site (Project Area) during works, then all works in the immediate area must cease and the area should be cordoned off. OEH must be notified by ringing the Enviroline 131 555 so that the site can be adequately assessed and managed.

Recommendation 4

In the unlikely event that skeletal remains are identified, work must cease immediately in the vicinity of the remains and the area must be cordoned off. The proponent must contact the local NSW Police who will make an initial assessment as to whether the remains are part of a crime scene or possible Aboriginal remains. If the remains are thought to be Aboriginal, OEH must be contacted by ringing the Enviroline 131 555. An OEH officer will determine if the remains are Aboriginal or not; and a management plan must be developed in consultation with the relevant Aboriginal stakeholders before works recommence.

Recommendation 5

If, during the course of development works, suspected historic cultural heritage material is uncovered, work should cease in that area immediately. The Heritage Branch, Office of Environment & Heritage (Enviroline 131 555) should be notified and works only recommence when an approved management strategy has been developed.

Terms, Definitions, and Abbreviations

Abbreviation/ Term	Meaning
Aboriginal Object	"any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises NSW, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains" (DECCW 2010:18).
Aboriginal Place	"a place declared under s.84 of the NPW Act that, in the opinion of the Minister, is or was of special significance to Aboriginal culture" (DECCW 2010:18). Aboriginal places have been gazetted by the minister.
Activity	A project, development, or work (this term is used in its ordinary meaning and is not restricted to an activity as defined by Part 5 EP&A Act 1979).
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
CEMP	Construction Environmental Management Plan
DECCW	Department of Environment, Climate Change and Water (is now the Office of Environment and Heritage – OEH)
Disturbed Land	"Land is disturbed if it has been the subject of a human activity that has changed the land's surface, being changes that remain clear and observable." (DECCW 2010:18).
Due Diligence	"taking reasonable and practical steps to determine whether a person's actions will harm an Aboriginal object and, if so, what measures can be taken to avoid that harm" (DECCW 2010:18)
EP&A Act	*Environmental Planning and Assessment Act 1979 (NSW)*
GDA	Geodetic Datum Australia
Harm	"destroy, deface, damage an object, move an object from the land on which it is situated, cause or permit an object to be harmed." (DECCW 2010:18)
LGA	Local Government Area
NPWS	National Parks and Wildlife Service
NPW Act	*National Parks and Wildlife Act 1974* (NSW)
NPW Regulation	*National Parks and Wildlife Regulation 2009* (NSW)
OEH	Office of Environment and Heritage (formerly DECCW)
PAD	Potential Archaeological Deposit
Project Area	Project Area is the area subject to the desktop study in this report

1.0 Introduction

RPS has been engaged by Cooranbong Water (a wholly owned subsidiary of Flow Systems Pty Ltd) (the proponent) to prepare a Heritage Due Diligence Assessment for the proposed Cooranbong Local Water Centre (LWC). The purpose of a due diligence assessment is to demonstrate that reasonable and practicable measures were taken to prevent harm to an Aboriginal object or place and should be undertaken in accordance with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (2010) ("Due Diligence Code").

This report has outlined the relevant environmental and archaeological context, landforms, landscape features, disturbances, legislative context and the nature of the proposed activity. This information has been considered in formulating the recommendations.

1.1 The Project Area

The Project Area is the LWC Site which is on part of 617 Freemans Drive, Cooranbong (Lot 12, DP1158508) in the Lake Macquarie Local Government Area (LGA). The nearest regional centre to the LWC Site is Morisset, located approximately five kilometres to the south east (**Figure 1**).

The north Cooranbong area has been identified in the Lower Hunter Regional Strategy as being a future residential development area to accommodate up to 3000 residential lots. This due diligence assessment has been prepared for the area subject to the proposed activity, herein referred to as the "Project Area". The Project Area is located adjacent to the former Cooranbong Aerodrome and includes a number of surrounding landholdings. It is located to the north of the existing Cooranbong village and adjoins existing residential areas of Cooranbong.

1.2 The Proposed Activity

This report has been prepared as a supporting document for a Review of Environmental Factors (REF) for the construction and operation of a proposed water recycling facility at 617 Freemans Drive, Cooranbong.

The proposed activity is for the construction of sewer infrastructure to support future residential development in the area. The construction of the Cooranbong LWC will commence with the detailed excavations and installation of underslab pipework and conduits followed by traditional form, reinforcement and pouring of concrete floors and walls. The concrete tanks will be hydraulically tested and the building finished with architectural finishes. The steel storage tanks will be constructed on concrete ring beam foundations. Spoil from the construction works is expected to be minimal and will be managed in accordance with a Construction Environmental Management Plan (CEMP) for the proposal. It is likely that all spoil will be used for re-contouring of the land surrounding the building and facilities.

The following plant and equipment would be required to undertake the proposed works:

- Front end loader / Chainsaws / Mulcher;
- Small tipper trucks;
- Rigid and articulated delivery trucks;
- Excavator;
- Concrete trucks;
- Cranes;
- Grader;

- Portable generators;
- Scaffold;
- Elevated work platforms; and
- General construction / building tools.

Ground disturbance works will include all excavation works and impacts from associated equipment and therefore a due diligence assessment is required under S1 and S2a of the Due Diligence Code (DECCW 2010:11).

1.3 Authorship and Acknowledgements

This report was prepared by RPS Cultural Heritage Consultant Philippa Sokol. The report was reviewed by Laraine Nelson, Senior Cultural Heritage Consultant.

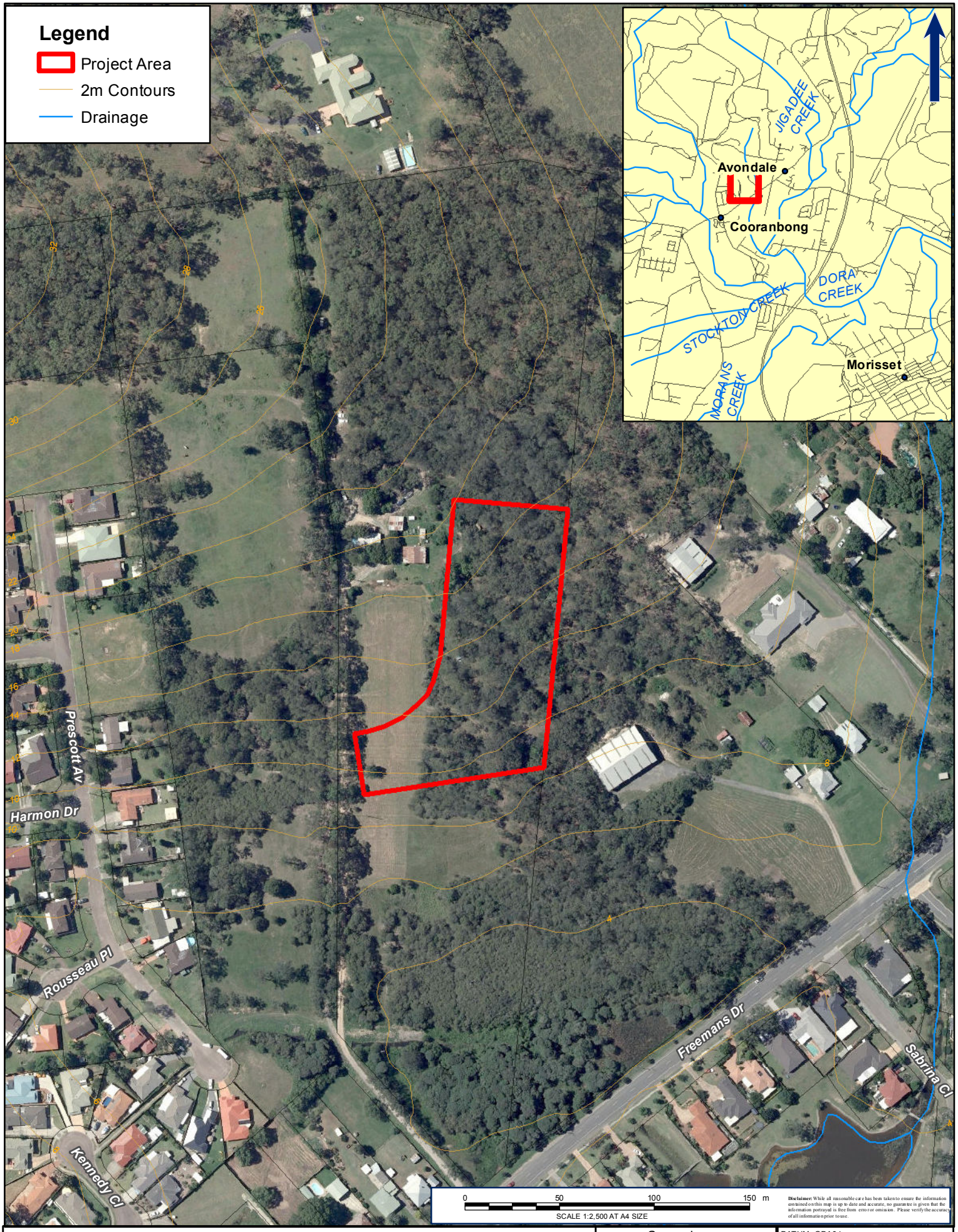

Figure 1: Project Area Location

LOCATION: Cooranbong	DATUM: GDA94 PROJECTION: MGA Zone 56
JOB NO.: **PR122011-3** PURPOSE: HERITAGE Technician: Natalie.Wood Date: 4/06/2014	Data Sources: Client Supplied

CLIENT: Flow Systems Pty Ltd

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2.0 Legislative Context

The following overview of the legal framework is provided solely for information purposes for the client, it should not be interpreted as legal advice. RPS will not be liable for any actions taken by any person, body or group as a result of this general overview, and recommend that specific legal advice be obtained from a qualified legal practitioner prior to any action being taken as a result of the summary below.

Although there are a number of Acts protecting and managing cultural heritage in New South Wales (see **Appendix 1**); the primary ones which apply to this report include:

- *National Parks & Wildlife Act 1974*
- *National Parks & Wildlife Regulation 2009*

In brief, the *National Parks & Wildlife Act 1974* protects Aboriginal heritage (places, sites and objects) within NSW; the National Parks and Wildlife Regulation 2009 provides a framework for undertaking activities and exercising due diligence.

2.1 *National Parks & Wildlife Act 1974*

The *National Parks & Wildlife Act 1974* (NPW Act) protects Aboriginal heritage (places, sites and objects) within NSW. Protection of Aboriginal heritage is outlined in s86 of the Act, as follows:

- "A person must not harm or desecrate an object that the person knows is an Aboriginal object" s86(1),
- "A person must not harm an Aboriginal object" s86(2)
- "A person must not harm or desecrate an Aboriginal place" s86(4).

Penalties apply for harming an Aboriginal object or place. The penalty for knowingly harming an Aboriginal object (s86[1]) and/or an Aboriginal place (s86[4]) is up to $550,000 for an individual and/or imprisonment for 2 years; and in the case of a corporation the penalty is up to $1.1 million. The penalty for a strict liability offence (s86[2]) is up to $110,000 for an individual and $220,000 for a corporation.

Harm under the NPW Act is defined as any act that; destroys defaces or damages the object, moves the object from the land on which it has been situated, causes or permits the object to be harmed. However, it is a defence from prosecution if the proponent can demonstrate 1) that harm was authorised under an Aboriginal Heritage Impact Permit (AHIP) (and the permit was properly followed), or 2) that the proponent exercised due diligence in respect to Aboriginal heritage. The **'due diligence' defence (s87(2))**, states that if a person or company has exercised due diligence to ascertain that no Aboriginal object was likely to be harmed as a result of the activities proposed for the Project Area (subject area of the proposed activity); then liability from prosecution under the NPW Act will be removed or mitigated if it later transpires that an Aboriginal object was harmed.

Notification of Aboriginal Objects

Under section 89A of the NPW Act Aboriginal objects (and sites) must be reported to the Director-General (now Chief Executive) of OEH within a reasonable time (unless it has previously been recorded and submitted to AHIMS). Penalties of $11,000 for an individual and $22,000 for a corporation may apply for each object not reported.

2.2 *National Parks and Wildlife Regulation 2009*

The *National Parks and Wildlife Regulation 2009* ("NPW Regulation") provides a framework for undertaking activities and exercising due diligence in respect to Aboriginal heritage. The NPW Regulation 2009 outlines the recognised due diligence codes of practice which are relevant to this report, but it also outlines procedures for Aboriginal Heritage Impact Permit (AHIP) applications and Aboriginal Cultural Heritage Consultation Requirements (ACHCRs); amongst other regulatory processes.

2.3 Due Diligence and Codes of Practice

The aims of a due diligence assessment is to:

- assist in avoiding unintended harm to Aboriginal objects;
- provide certainty to land managers and developers about appropriate measures for them to take;
- encourage a precautionary approach;
- provide a defence against prosecution if the process is followed; and
- result in more effective conservation outcomes for Aboriginal cultural heritage.

One of the benefits of the due diligence provisions are that they provide a simplified process of investigating the Aboriginal archaeological context of an area to determine if an Aboriginal Heritage Impact Permit (AHIP) is required.

Under the s80A *National Parks & Wildlife Regulation* 2009 ("NPW Regulation") a number of due diligence codes are recognised.

This report has been written to meet the Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (2010) ("Due Diligence Code").

2.3.1 *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (DECCW 2010)

This publication sets out a minimum benchmark for acceptable due diligence investigations to be followed. The purpose of the code is set out reasonable and practical steps in order to:

(1) identify whether or not Aboriginal objects (and places) are, or are likely to be, present in an area

(2) determine whether or not their activities are likely to harm Aboriginal objects (if present)

(3) determine whether an AHIP application is required. (DECCW 2010:2)

Investigations under the code include the following:

- A search of the Aboriginal Heritage Information Management System (AHIMS) database to identify if there are previously recorded Aboriginal objects or places in the Project area,
- Identification of landscape features including, land within 200m of water, dune systems, ridgetops, headlands, land immediately above or below cliff faces and/or rockshelters/caves,
- Desktop assessment including a review of previous archaeological and heritage studies and any other relevant material,
- Visual inspection of the project area to identify if there are Aboriginal objects present, and
- Assessment as to whether an AHIP is required.

This report has complied with the requirements of the code listed above. Other requirements under the code are outlined below.

Aboriginal consultation is not required for an investigation under the due diligence code (DECCW 2010:3). However, if the due diligence investigation shows that the activities proposed for the area are likely to harm objects or likely objects within the landscape, then an Aboriginal Heritage Impact Permit will be required with full consultation.

A record of the due diligence procedure followed must be kept to ensure it can be used as a defence from prosecution (DECCW 2010:15).

Following a due diligence assessment (where an AHIP application was not required), an activity must proceed with caution. If any Aboriginal objects are identified during the activity, then works should cease in that area and OEH notified (DECCW 2010:13). The due diligence defence does not authorise continuing harm.

2.4 Aboriginal Community Consultation

Aboriginal community consultation is not a formal requirement of the due diligence process (DECCW 2010:3, Minerals Council 2010:7); therefore the proponent is not obliged to undertake Aboriginal community consultation.

Aboriginal community consultation was not undertaken for this due diligence assessment.

3.0 Environmental Context

The purpose of reviewing the relevant environmental information is to assist in identifying whether Aboriginal objects or places are present within the Project Area. The environmental context forms part of the desktop assessment required under the Due Diligence Code (DECCW 2010:12-13).

3.1 Geology and Soils

The underlying geology of the Project Area is composed of the Narrabeen Group and Clifton Subgroup. The Munmorah Conglomerate Formations exists in the area and comprises sandstone, interbedded sandstone and siltstone, claystone with conglomerate and sandstone of the Widden Brook conglomerate.

The Project Area is located on the Doyalson soil landscape. This landscape generally comprises a topsoil of up to 10cm of brown loose loamy sand (do1) which overlies 10-30cm of hardsetting bleached yellowish brown clayey sand (do2) on top of 30-60cm of earthy bright yellowish brown sandy clay loam (do3). The Do3 layer will occasionally overlie up to 50cm of a massive pale grey clay (do4). The presence of Do5 is at a subsoil level (B horizon) on fine-grained bedrock (Murphy 1993: 49-51).

3.2 Topography and Hydrology

The Project Area is situated on a gently sloping lower slope landform with an elevation less than fifteen metres AHD (Australian Height Datum) Topographic Map Sheet Morisset 9131-1N (Lands and Property Information 2002).

The Project Area is located approximately 300 metres west from a second order unnamed tributary of Dora Creek. The closest permanent water source to the Project Area is Jigadee Creek situated approximately 700 metres to the south east. Local and ephemeral water sources in the local area could have been used by Aboriginal people in the past.

3.3 Flora and Fauna

The purpose of this section is to provide an indication of the types of flora and fauna resources which were likely to have been available to Aboriginal people in the past. It is based on broad scale vegetation mapping for NSW (Keith 2006) and does not replace more detailed studies undertaken for the Project Area.

The vegetation in the Project Area consists of the Sydney Coastal Dry Sclerophyll Forest. This is the most diverse of the three classes of dry sclerophyll forests, and is unique to the Sydney Basin. This class encompasses a wide range of related forest and woodland communities, whose species composition and structure vary with topography and soil moisture. The open eucalypt canopy varies in height from approximately 10 to 25 metres, in correlation with the quality of the soil drainage. Typical tree species which populate this vegetation community include Sydney Red Gum, Red Bloodwood, Sydney Peppermint, Brown Stringybark, Broad-leaved and Narrow-leaved Scribbly Gum, Silvertop Ash, Old Man Banksia and Christmas Bush. The sclerophyll shrub understorey is diverse and includes several species of Wattle, Banksia, Heath, flowering shrubs and Tea tree (Keith 2006:146-147).

3.4 Synthesis of Environmental Context

Overview of the environmental context indicates that the necessary resources for the support of human inhabitants in the area were available. There are a number of water sources surrounding the Project Area, which would have provided an attractive habitat for flora and fauna resources that may have been procured by Aboriginal people. Sandstone formations in the regional area, particularly to the west, may have provided adequate protection and shelter during inclement weather.

4.0 Heritage Context

The purpose of reviewing the relevant heritage information is to assist in identifying whether Aboriginal objects or places are present within the Project Area. The heritage context forms part of the desktop assessment required under the Due Diligence Code (DECCW 2010:12-13).

4.1 Aboriginal Heritage Information Management System (AHIMS)

A search was undertaken of the Aboriginal Heritage Information Management System (AHIMS) database for an approximate 10 kilometre radius around the Project Area, using the following coordinates: GDA Zone 56, Eastings 350730 to 361021 and Northings 6334860 to 6344860 (**Appendix 2**). The search revealed that there are 24 previously recorded Aboriginal sites within these coordinates (**Table 1** and **Figure 2**). No Aboriginal Places were identified in or near the Project Area.

The search identified that the closest recorded Aboriginal site to the Project Area is AHIMS#45-3-3274, an isolated artefact, approximately two kilometres to the south west. This site is outside the proposed Project Area.

Table 1 Summary of AHIMS Sites within the searched coordinates

Sites	Frequency	Percent
Artefact Scatter	11	45.85
Isolated Find	4	16.67
Artefact Site (number unspecified)	3	12.5
Potential Archaeological Deposit (PAD)	2	8.33
Scar Tree	2	8.33
Artefact Scatter; Shell	1	4.16
Midden	1	4.16
Total	**24**	**100**

Source: AHIMS 15 April 2014

A number of Aboriginal site types have been identified in the vicinity of the Project Area. Stone artefact sites are the most common in the search area and are in the form of artefact scatters (n=11), isolated finds (n=4) and artefact sites with artefact count unspecified (n=3). PAD sites (n=2) and scar trees (n=2) are the next most common site type in the search. PAD sites are generally located on elevated landforms near to water sources and scar trees are usually found in vegetated areas that have not been subject to land clearing, disturbance and modifications. A midden site (n=1) and artefact scatter with shell site (n=1), have also been recorded in the area and both are located along the shoreline of Lake Macquarie.

4.2 Historic Heritage Register Searches

4.2.1 NSW State Heritage Inventory

The State Heritage Inventory is maintained by the Heritage Branch of the Office of Environment & Heritage (NSW). It contains State non-Indigenous heritage information including:

- State Heritage Register
- Section 170 Heritage Items
- Locally significant items

A search of the State Heritage Inventory database on 23 May 2014 identified three items/places in the Cooranbong locality which are detailed in **Table 2**.

Table 2 Items listed on the State Heritage Inventory

Item	Address	Heritage Listing	Significance	Proximity to Project Area
Cottage	661 Freemans Drive, Cooranbong	State Heritage Inventory	Local	200m
House 'Three Bells'	597 Freemans Drive (west side)	State Heritage Inventory	Regional	200m

No historic heritage items were identified within the Project Area. The local and regional historic items were the closest to the Project Area; include a Cottage approximately 200 metres north east and the Three Bells house approximately 200 metres south west. As these two items are situated outside of the Project Area and are located at a sufficient distance that they do not place constraints for the proposed activity.

4.2.2 Lake Macquarie Local Environmental Plan

The Lake Macquarie Local Environmental Plan (LEP) provides a list of historic items that have been listed by the council as having heritage value. In some cases items of Aboriginal cultural heritage are also listed.

A search of Schedule 4 of the Lake Macquarie LEP (2004) identified 18 items in the Cooranbong area; however these items are located 500 metres and more from the Project Area and therefore place no constraints for the activity.

4.3 Synthesis of Historic Heritage

The search of historic heritage databases identified no items of historic heritage significance within the Project Area.

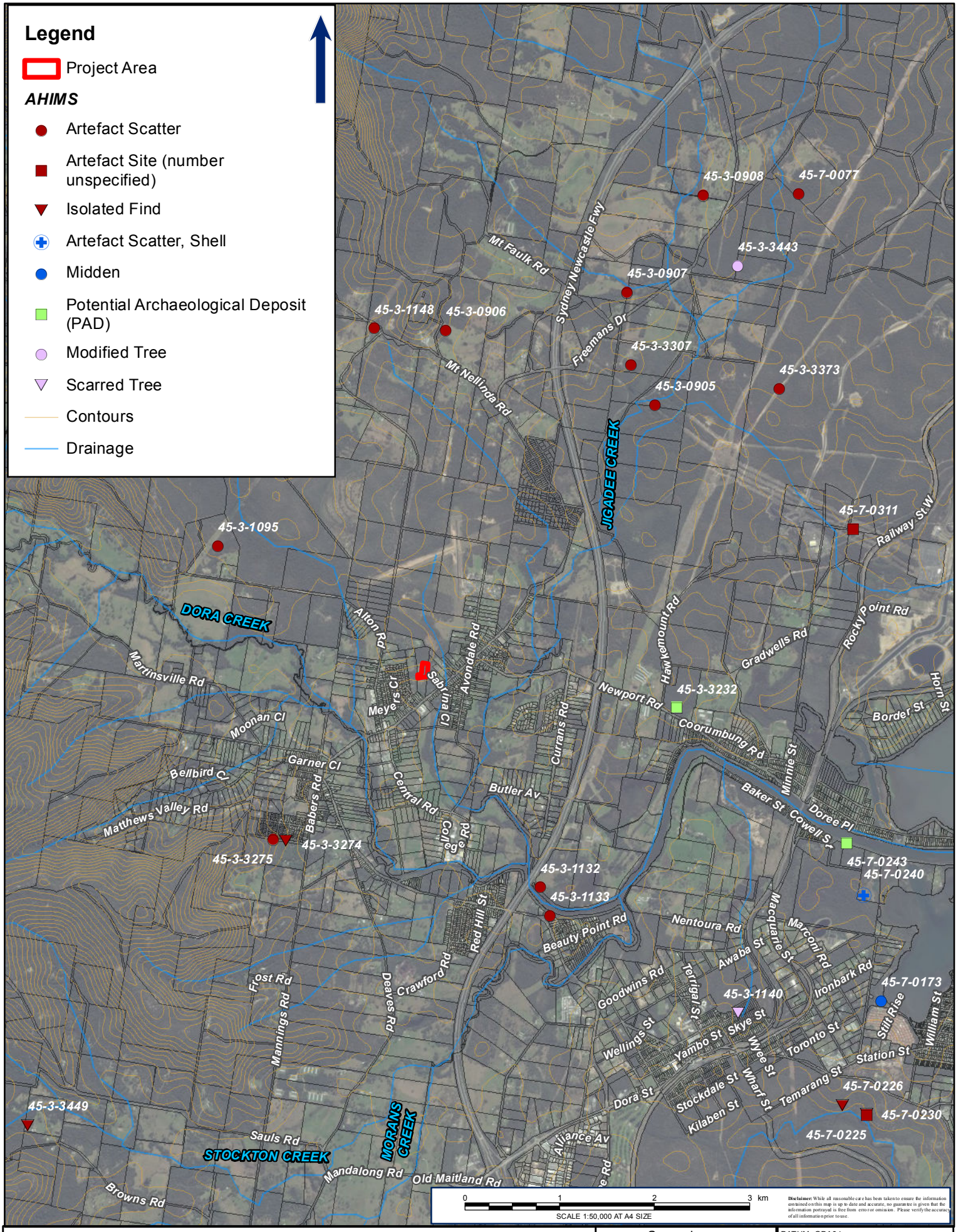

Figure 2: Project Area with AHIMS

LOCATION: Cooranbong	DATUM: GDA94 PROJECTION: MGA Zone 56
JOB NO.: **PR122011-3** PURPOSE: HERITAGE Technician: Natalie.Wood Date: 4/06/2014	Data Sources: Client Supplied

CLIENT: Flow Systems Pty Ltd

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4.4 Archaeological and Heritage Literature Review

A review of previous archaeological and heritage reports has been undertaken to inform this due diligence assessment.

Insite Heritage, 2008. Archaeology Assessment of Part Lot 358 DP 755242 and Part Lot 9 DP 244002 Morisset Park.

The study was conducted to support a rezoning application from Zone 10 Investigation to Zone 2(1) Residential. The study was situated at Morisset Park Road, Morisset Park, approximately five kilometres to the south east of the current Project Area.

The soils in the area consisted of silty and clayey sands in the Doyalson soil landscape. The pedestrian field survey identified three landscape units, described as: slope between 2-5 degrees (85%of the area); slope <2 degrees (10% of the area); and elevated terrace crest (5% of the area).

The field survey identified the potential for Aboriginal objects within a small portion of the surveyed area. It was concluded that there was a low to moderate potential for a small number of artefacts to be concealed under topsoil with a recommendation that the area be designated a PAD (Insite Heritage 2008).

RPS HSO, 2008. Aboriginal and European Cultural Heritage Assessment for a Proposed Rezoning at Newport Road and Highland Avenue, Cooranbong NSW

RPS Harper Somers O'Sullivan was engaged by Lake Macquarie City Council to conduct an archaeological study for a portion of land to be rezoned from the current Zone 10 (Investigation) to 1(2) Rural living and part 2(1) Residential. This study area was approximately 500 metres to the east of the current Project Area.

The study area comprised the creek bank and floodplain of Jigadee Creek. The visual inspection included inspection of the creek bank, drainage lines, tracks and erosion scalds given their high visibility.

The field survey identified no Aboriginal cultural heritage objects and no evidence of historical items. The potential for Aboriginal objects to be present was considered to be low as the study area was located on an alluvial floodplain. In addition to this the area has also been subject to previous logging and clearing practices and long term use for cattle grazing (RPS Harper Somers O'Sullivan 2008). .

RPS HSO, 2009. Due Diligence Inspection for the proposed Cooranbong Haul Road.

RPS Harper Somers O'Sullivan was engaged by Centennial Coal to undertake an Aboriginal archaeological due diligence inspection for a proposed private haul road, 3.4 kilometres in length, between the Centennial owned Cooranbong Colliery and the existing Newstan-Eraring haul road. This due diligence inspection was undertaken approximately four kilometres north east of the current Project Area.

The field survey covered a representative sample of ground surfaces and landform units which included crests, slopes and drainage lines. The study area generally had low archaeological potential owing to the lack of suitable landforms for Aboriginal occupation, the lack of reliable water sources and localised disturbance caused by erosion and waste dumping. No Aboriginal sites or objects were identified during the field survey (RPS Harper Somers O'Sullivan 2009).

4.5 Synthesis of Heritage Context

A review of the AHIMS data and previous archaeological work in the area suggests that the wider area may have been rich in resources, especially in close proximity to a reliable water source. The AHIMS data shows that past Aboriginal communities made use of the shoreline of Lake Macquarie and other inland permanent water sources such as creeks. With regards creeks and inland waterways, elevated portions of land away from the inundated areas would be considered favourable locations for occupation by Aboriginal people and therefore have the potential to contain stone artefacts, PAD sites and modified trees, however this generally depends on the level of vegetation and ground disturbance. Previous studies suggest that this area was not regularly occupied by Aboriginal people especially for locations further away from watercourses. In addition, previous disturbances in the area make the potential for finding *in situ* deposits of Aboriginal objects low.

5.0 Visual Inspection and Field Results

A visual inspection of the Project Area was undertaken to identify whether Aboriginal objects are present on the ground surface or are likely to be present below the ground surface. In accordance with the Due Diligence Code a qualified archaeologist undertook the visual inspection (DECCW 2010:12-13).

5.1 Visual Inspection

RPS Cultural Heritage Consultant Philippa Sokol conducted the visual inspection of the Project Area on Wednesday 16 April 2014. The visual inspection was conducted on foot (pedestrian). The visual inspection was conducted on a sunny and humid day. The Project Area was assessed as one survey unit.

The surveyed area was located on a portion of land approximately 150 metres north of Freemans Drive, Cooranbong and was situated on a lower slope landform with a very gentle slope trending in a south east direction (Plate 1) with an open aspect. The proposed retention basin for drainage and sewer infrastructure will be partly positioned in this area.

There were no watercourses identified in the Project Area, with the closest water source being a second order tributary of Dora Creek approximately 300 metres to the east.

Ground surface exposure varied, being low in the areas that were vegetated and higher in the cleared areas that had been recently disturbed by vehicles. The approximate exposure for the Project Area was 25% with a ground surface visibility at approximately 80%. Vegetation in the south west of the area was a dense, compact grass, with thick shrubs, vines, tall grass and scattered grass trees in the south. The remaining portions in the east comprised a canopy of mature native trees, dense melaleuca and thick shrubs (Plate 2). Soils in the area included a sandy loam in areas that were vegetated, occasionally with a dense organic texture, and a clayey B horizon on eroded exposures (Plate 3). Very little raw stone material was observed on the ground surface and no material was identified that would be considered suitable for stone tool manufacture. Disturbances included previous clearing works in the south western portion, installation of electricity poles, fencing works, churned up ground surface from vehicles in cleared area, access tracks through vegetation, a number of rubbish dump areas and ongoing erosion (Plate 4 & 5). Identified land uses in the Project Area include vehicle access via tracks, dumping of rubbish and general use of cleared areas. Access to the Project Area would be via an upgraded dirt access track, off Freemans Drive, between Alton Road and Sabrina Close (Plate 6).

5.2 Visual Inspection Field Results and Summary

The Project Area comprised several portions of land that had been subject to high levels of disturbance, including areas that had been repeatedly driven over and churned up by vehicles, in addition to fencing works and accumulated waste material. Natural forces such as erosion had also modified the ground surface. Ground surface exposure was moderate to low across the area, being especially low in areas of dense vegetation, and slightly higher in cleared areas, largely as a result of ongoing disturbances. The visible soils in vegetated areas were sandy loam, with a clayey B horizon exposed in eroded areas. Given the amount of ground surface disturbances in the Project Area, the likelihood of there being intact Aboriginal artefacts in the area is considered low to nil.

No Aboriginal objects or intact archaeological deposits were identified in the Project Area and as such there are no archaeological constraints to works proceeding in the area inspected.

6.0 Impact Assessment

The purpose of a due diligence assessment is to identify whether Aboriginal objects are present, or likely to be present, in the Project Area; to determine whether proposed activities are likely to harm Aboriginal objects (if present) and to determine whether an Aboriginal Heritage Impact Permit (AHIP) is required.

The project involves the construction and operation of a water recycling facility known as the Cooranbong LWC.

The results of the AHIMS search and the visual inspection indicate that there are no identified Aboriginal objects in the Project Area. As there are no identified Aboriginal objects in the Project Area it is assessed that there is no identified risk of harm to Aboriginal objects and an AHIP is not required for the proposed activity.

As there are no identified Aboriginal objects in the Project Area and the landforms are not considered to be archaeologically sensitive, it is assessed that there is no identified risk of harm to Aboriginal objects and an AHIP is not required for the proposed activity.

7.0 Conclusions and Recommendations

This report has considered the available environmental and archaeological information for the Project Area, the land condition and the nature of the proposed activities. A pedestrian survey of the Project Area was conducted on Wednesday 16 April 2014 by RPS Cultural Heritage Consultant Philippa Sokol. The area is situated on a portion of land approximately 150 metres north of Freemans Drive at Cooranbong. The Project Area has been subject to high levels of disturbance associated with dirt access tracks traversing the area including vegetated areas, previous clearing, vehicle use in cleared areas, fencing, accumulated debris and erosion. Ground surface exposures exhibited a sandy loam in vegetated areas with a clayey B horizon on eroded tracks. No material was seen that would be suitable for the production of stone tools.

As there are no identified Aboriginal objects in the Project Area and the landform is not considered to be archaeologically sensitive, it is assessed that there is no identified risk of harm to Aboriginal objects and an AHIP is not required for the proposed activity.

The following recommendations are made in relation to the proposed activity:

Recommendation 1

All relevant Cooranbong Water staff and contractors should be made aware of their statutory obligations for heritage under the *National Parks and Wildlife Act* 1974 and the *Heritage Act* 1977, which may be implemented as a heritage induction.

Recommendation 2

This due diligence assessment must be kept by Cooranbong Water so that it can be presented, if needed, as a defence from prosecution under Section 86(2) of the *National Parks and Wildlife Act* 1974.

Recommendation 3

If unrecorded Aboriginal object/s are identified in the LWC Site (Project Area) during works, then all works in the immediate area must cease and the area should be cordoned off. OEH must be notified by ringing the Enviroline 131 555 so that the site can be adequately assessed and managed.

Recommendation 4

In the unlikely event that skeletal remains are identified, work must cease immediately in the vicinity of the remains and the area must be cordoned off. The proponent must contact the local NSW Police who will make an initial assessment as to whether the remains are part of a crime scene or possible Aboriginal remains. If the remains are thought to be Aboriginal, OEH must be contacted by ringing the Enviroline 131 555. An OEH officer will determine if the remains are Aboriginal or not; and a management plan must be developed in consultation with the relevant Aboriginal stakeholders before works recommence.

Recommendation 5

If, during the course of development works, suspected historic cultural heritage material is uncovered, work should cease in that area immediately. The Heritage Branch, Office of Environment & Heritage (Enviroline 131 555) should be notified and works only recommence when an approved management strategy has been developed.

8.0 References

DECCW. 2010. "Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales." in *Part 6 National Parks and Wildlife Act 1974*, edited by Godwin S.

Insite Heritage. 2008. "Archaeology Assessment of Part Lot 358 DP755242 Part Lot 9 DP244002 Morisset Park." De Witt Consulting Pty Ltd.

Keith, D. 2006. *Ocean Shores to Desert Dunes: The Native Vegetation of New South Wales and the ACT*. Sydney: Department of Environment and Conservation NSW.

Lands and Property Information. 2002. "Morisset 1:25 000 Topographic and Orthophoto Map."

Murphy, C.L. 1993. *Soil Landscapes of the Gosford-Lake Macquarie 1:100,000 Sheet (Redhead, Wyong, Gosford, Spencer, Laguna)*: Department of Conservation and Land Management.

RPS Harper Somers O'Sullivan. 2008. "Aboriginal & European Cultural Hertage Assessment For a Proposed Rezoning at Newport Road and Highland Avenue Cooranbong NSW." RPS HSO report to the Lake Macquarie City Council.

RPS Harper Somers O'Sullivan. 2009. "Due diligence inspection for the proposed Cooranbong haul road." Unpublished report to Centennial Coal Pty Ltd.

9.0 Plates

Plate 1 View to the south east showing the cleared portion of the Project Area with areas of vegetation to the east

Plate 2 View to the north west showing the dense vegetation type in the Project Area

Plate 3 View of clayey B horizon soils in the Project Area

Plate 4 View to the south east showing the highly disturbed cleared area from vehicle use, water sodden wit exposed sandy loam soils

Plate 5 View to the east showing previous clearing, fencing and some of the dumped debris

Plate 6 View facing north showing access track to the Project Area

Appendix 1

Legislative Requirements

Summary of Statutory Controls

The following overview of the legal framework is provided solely for information purposes for the client, it should not be interpreted as legal advice. RPS will not be liable for any actions taken by any person, body or group as a result of this general overview, and recommend that specific legal advice be obtained from a qualified legal practitioner prior to any action being taken as a result of the summary below.

COMMONWEALTH

Aboriginal & Torres Strait Islander Heritage Protection Act 1984 (ATSIHIP Act)

The purpose of this Act is to preserve and protect all heritage places of particular significance to Aboriginal and Torres Strait Islander people. This Act applies to all sites and objects across Australia and in Australian waters (s4).

It would appear that the intention of this Act is to provide national baseline protection for Aboriginal places and objects where State legislation is absent. It is not to exclude or limit State laws (s7(1)). Should State legislation cover a matter already covered in the Commonwealth legislation, and a person contravenes that matter, that person may be prosecuted under either Act, but not both (s7(3)).

The Act provides for the preservation and protection of all Aboriginal objects and places from injury and/or desecration. A place is construed to be injured or desecrated if it is not treated consistently with the manner of Aboriginal tradition or is or likely to be adversely affected (s3).

STATE

It is incumbent on any land manager to adhere to state legislative requirements that protect Aboriginal Cultural heritage. The relevant legislation is NSW includes but is not limited to the summary below.

National Parks and Wildlife Act 1974 (NPW Act)

The NPW Act provides statutory protection for all Aboriginal heritage, places and objects (not being a handicraft made for sale), with penalties levied for breaches of the Act. This legislation is overseen by the Office of Environment and Heritage (OEH), and specifically the Chief Executive (formerly the Director-General) of OEH. Part 6 of this Act is the relevant part concerned with Aboriginal objects and places, with Section 86 and Section 90 being the most pertinent. In 2010, this Act was substantially amended, particularly with respect to Aboriginal cultural heritage requirements. Relevant sections include:

Section 86

This section now lists four major offences:

(1) A person must not harm an object that the person knows is an Aboriginal object;

(2) A person must not harm and Aboriginal object;

(3) For the purposes of s86, “circumstances of aggravation” include:

  (a) The offence being committed during the course of a commercial activity; or

  (b) That the offence was the second or subsequent offence committed by the person;

(4) A person must not harm or desecrate an Aboriginal place.

Offences under s86 (2) and (4) are now strict liability offences, i.e., knowledge that the object or place harmed was an Aboriginal object or place needs to be proven. Penalties for all offences under Part 6 of this Act have also been substantially increased, depending on the nature and severity of the offence.

Section 87

This section now provides defences to the offences of s86. These offences chiefly consist of having an appropriate Aboriginal Heritage Impact Permit (AHIP), not contravening the conditions of the AHIP or demonstrating that due diligence was exercised prior to the alleged offence.

Section 87A & 87B

These sections provide exemptions from the operation of s86; Section 87A for authorities such as the Rural Fire Service, State Emergency Services and officers of the National Parks & Wildlife Service in the performance of their duties, and s87B for Aboriginal people performing traditional activities.

Section 89A

If a person knows of the location of an Aboriginal object or place that has not been previously registered and does not advise the Director-General (now Chief Executive) of that object or place within a reasonable period of time, then that person is guilty of an offence under this Section of the Act.

Section 90

This section authorises the Director-General (now Chief Executive) to issue and AHIP.

Section 90A-90R

These sections govern the requirements relating to applying for an AHIP. In addition to the amendments to the Act, OEH have issued three new policy documents clarifying OEH's requirements with regards to Aboriginal archaeological investigations: *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010, Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW and Code of Practice for Archaeological Investigations in NSW*. The Consultation Requirements formalise the consultation with Aboriginal community groups into four main stages, and includes details regarding the parties required to be consulted, advertisements inviting Aboriginal community groups to participate in the consultation process, requirements regarding the provision of methodologies, draft and final reports to the Aboriginal stakeholders and timetables for the four stages. The Due Diligence Code of Practice sets out the minimum requirements for investigation, with particular regard as to whether an AHIP is required. The Code of Practice for Archaeological Investigation sets out the minimum requirements for archaeological investigation of Aboriginal sites.

Aboriginal Heritage Impact Permits (AHIP)

OEH encourages consultation with relevant Aboriginal stakeholders for all Aboriginal Heritage Assessments. However, if an Aboriginal Heritage Impact Permit (AHIP) is required for an Aboriginal site, then specific OEH guidelines are triggered for Aboriginal consultation.

Aboriginal Cultural Heritage Consultation Requirements for Proponents

In 2010, the Aboriginal Cultural Heritage Consultation Requirements for Proponents (ACHCRs) were issued by OEH (12 April 2010). These consultation requirements replace the previously issued Interim Community Consultation Requirements (ICCR) for Applicants (Dec 2004). These guidelines apply to all AHIP applications prepared after 12th April 2010; for projects commenced prior to 12th April 2010, transitional

arrangements have been stipulated in a supporting document, Questions and Answers 2: Transitional Arrangements.

The ACHCRs 2010 include a four stage Aboriginal consultation process and stipulate specific timeframes for each state. Stage 1 requires that Aboriginal people who hold cultural information are identified, notified and invited to register an expression of interest in the assessment. Stage 1 includes the identification of Aboriginal people who may have an interest in the project area and hold information relevant to determining the cultural significance of Aboriginal objects or places. This identification process should draw on reasonable sources of information including: the relevant OEH EPRG regional office, the relevant Local Aboriginal Land Council(s), the Registrar of Aboriginal Owners, Aboriginal Land Rights Act (1983), the Native Title Tribunal, Native Title Services Corporation Limited, the relevant local council(s), and the relevant catchment management authority. The identification process should also include an advertisement placed in a local newspaper circulating in the general location of the project area. Aboriginal organisations and/or individuals identified should be notified of the project and invited to register an expression of inters (EoI) for Aboriginal consultation. Once a list of Aboriginal stakeholders has been compiled from the EoI's, they need to be consulted in accordance with ACHCR's Stages 2, 3 and 4.

Environmental Planning & Assessment Act 1979 (EP&A Act)

This Act regulates a system of environmental planning and assessment for New South Wales. Land use planning requires that environmental impacts are considered, including the impact on cultural heritage and specifically Aboriginal heritage. Within the EP&A Act, Parts 3, 4 and 5 relate to Aboriginal heritage.

Part 3 regulates the preparation of planning policies and plans. Part 4 governs the manner in which consent authorities determine development applications and outlines those that require an environmental impact statement. Part 5 regulates government agencies that act as determining authorities for activities conducted by that agency or by authority from the agency. The National Parks & Wildlife Service is a Part 5 authority under the EP&A Act.

In brief, the NPW Act provides protection for Aboriginal objects or places, while the EP&A Act ensures that Aboriginal cultural heritage is properly assessed in land use planning and development.

Heritage Act 1977

This Act protects the natural and cultural history of NSW with emphasis on non-indigenous cultural heritage through protection provisions and the establishment of a Heritage Council. Although Aboriginal heritage sites and objects are primarily protected by the *National Parks & Wildlife Act* 1974, if an Aboriginal site, object or place is of great significance, it may be protected by a heritage order issued by the Minister subject to advice by the Heritage Council.

Other legislation of relevance to Aboriginal cultural heritage in NSW includes the *NSW Local Government Act* 1993. Local planning instruments also contain provisions relating to indigenous heritage and development conditions of consent.

Appendix 2

AHIMS

AHIMS Web Services (AWS)
Search Result

Your Ref Number : PR122011-1

Client Service ID : 131871

RPS Australia East Pty Ltd -Hamilton

Date: 15 April 2014

Accounts Payable Fortitude Valley PO Box 237
Brisbane Queensland 4006

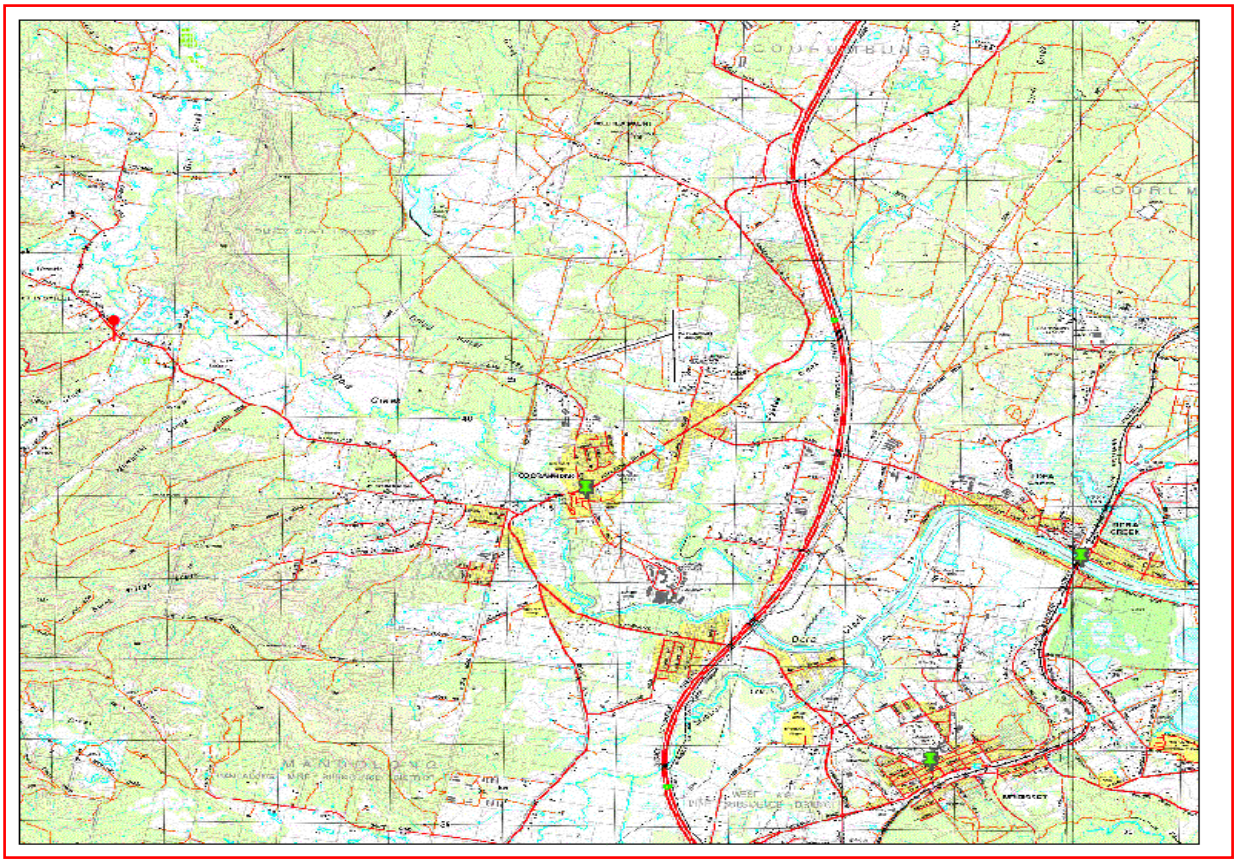
Attention: Cultural Heritage Team Administrator

Email: clh@rpsgroup.com.au

Dear Sir or Madam:

AHIMS Web Service search for the following area at Datum :GDA, Zone : 56, Eastings : 350730 - 361021, Northings : 6334860 - 6344860 with a Buffer of 0 meters, conducted by Cultural Heritage Team Administrator on 15 April 2014.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

24	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (http://www.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Office of Environment and Heritage's Aboriginal Heritage Information Unit upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Office of Environment and Heritage and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date .Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

PO BOX 1967 Hurstville NSW 2220
43 Bridge Street HURSTVILLE NSW 2220
Tel: (02)9585 6345 (02)9585 6471 Fax: (02)9585 6094

ABN 30 841 387 271
Email: ahims@environment.nsw.gov.au
Web: www.environment.nsw.gov.au

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref Number : PR122011-1

Client Service ID : 131871

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-7-0173	BB1;Fullers Creek, Bonnells Bay;	AGD	56	360800	6336100	Open site	Valid	Shell : -, Artefact : -	Midden	2693,102219
	Contact	**Recorders**	Mary Dallas Consulting Archaeologists,Kerry Navin					**Permits**		
45-3-3443	RPS NEWST23	GDA	56	359392	6344043	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	**Recorders**	Ms.Tessa Boer-Mah,RPS Australia East Pty Ltd -Hamilton					**Permits**		
45-7-0311	RPS NEWST 18	GDA	56	360611	6341266	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Mr.Roger Mehr,RPS Australia East Pty Ltd -Hamilton					**Permits**		
45-7-0226	K 4 Koompahtoo	AGD	56	360390	6334990	Open site	Valid	Artefact : -	Isolated Find	99218,102219
	Contact	**Recorders**	William Smith					**Permits**		
45-7-0225	K 3 Koompahtoo	AGD	56	360650	6334900	Open site	Valid	Artefact : -	Isolated Find	99218,102219
	Contact	**Recorders**	William Smith					**Permits**		
45-7-0077	Sandy Creek;	AGD	56	359925	6344618	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	**Recorders**	Len Dyall					**Permits**		
45-7-0240	Dora Creek (Stingaree Road)	AGD	56	360613	6337218	Open site	Valid	Artefact : 3, Shell : -		102219
	Contact Searle	**Recorders**	Mrs.Angela Besant					**Permits**	2215	
45-7-0243	WWSS3-2	AGD	56	360438	6337770	Open site	Valid	Potential Archaeological Deposit (PAD) : -		100134,102219
	Contact S Scanlon	**Recorders**	AECOM Australia Pty Ltd (previously HLA-Envirosciences)					**Permits**	2273	
45-3-3373	AA2	AGD	56	359722	6342564	Open site	Valid	Artefact : 2		
	Contact	**Recorders**	Indigenous Outcomes - Cheryl Kitchener					**Permits**		
45-3-3449	RPS MAND NTH 10	GDA	56	351896	6334973	Open site	Valid	Artefact : 1		
	Contact	**Recorders**	RPS Australia East Pty Ltd -Hamilton,Ms.Laraine Nelson					**Permits**		
45-3-1148	Mount Nellinda Morisset	AGD	56	355450	6343200	Open site	Valid	Artefact : -	Open Camp Site	494
	Contact	**Recorders**	Margrit Koettig					**Permits**		
45-3-0905	Sandy Creek;Sunday Creek;	AGD	56	358413	6342395	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	**Recorders**	Len Dyall					**Permits**		
45-3-0906	Dora Creek;Cooranbong;	AGD	56	356203	6343176	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	**Recorders**	Len Dyall					**Permits**		
45-3-0907	Old Maitland Road Sandy Creek Sunday Creek	AGD	56	358116	6343578	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	**Recorders**	ASRSYS					**Permits**		
45-3-0908	Old Maitland Road;Jigadee Creek;	AGD	56	358919	6344599	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	**Recorders**	Len Dyall					**Permits**		
45-3-1095	Cooranbong	AGD	56	353800	6340900	Open site	Valid	Artefact : -	Isolated Find,Open Camp Site	494

Report generated by AHIMS Web Service on 15/04/2014 for Cultural Heritage Team Administrator for the following area at Datum :GDA, Zone : 56, Eastings : 350730 - 361021, Northings : 6334860 - 6344860 with a Buffer of 0 meters. Additional Info : Background Information. Number of Aboriginal sites and Aboriginal objects found is 24

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref Number : PR122011-1

Client Service ID : 131871

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
	Contact	**Recorders**	Margrit Koettig					**Permits**		
45-3-1132	Dora Creek;Dora Creek North Bank;Beauty Point	AGD	56	357200	6337300	Open site	Valid	Artefact : -	Open Camp Site	305,102219
	Contact	**Recorders**	Len Dyall					**Permits**		
45-3-1133	Dora Creek;Dora Creek South Bank;Beauty Point;	AGD	56	357300	6337000	Open site	Valid	Artefact : -	Open Camp Site	305,102219
	Contact	**Recorders**	Len Dyall					**Permits**		
45-3-1140	Morisset;	AGD	56	359290	6335970	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	116,102219
	Contact	**Recorders**	Helen Brayshaw					**Permits**		
45-7-0230	K3 KOOMPAHTOO	AGD	56	360650	6334900	Open site	Valid	Artefact : -		102219
	Contact	**Recorders**	Stephen Griffen					**Permits**		
45-3-3232	Dora Ck Pad	AGD	56	358640	6339200	Open site	Valid	Potential Archaeological Deposit (PAD) : -		100145,102219
	Contact Searle	**Recorders**	Mrs.Angela Besant					**Permits**	2346	
45-3-3274	Cooranbong 1	AGD	56	354520	6337790	Open site	Valid	Artefact : 1		102219
	Contact T Russell	**Recorders**	South East Archaeology					**Permits**		
45-3-3275	Cooranbong 2	AGD	56	354380	6337800	Open site	Valid	Artefact : 3		102219
	Contact T Russell	**Recorders**	South East Archaeology					**Permits**		
45-3-3307	AA7	AGD	56	358156	6342811	Open site	Valid	Artefact : 4		
	Contact Searle	**Recorders**	Ms.Tracey Skene					**Permits**		

Report generated by AHIMS Web Service on 15/04/2014 for Cultural Heritage Team Administrator for the following area at Datum :GDA, Zone : 56, Eastings : 350730 - 361021, Northings : 6334860 - 6344860 with a Buffer of 0 meters. Additional Info : Background Information. Number of Aboriginal sites and Aboriginal objects found is 24

Appendix 6

Flooding Impact Assessment

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Level 5, 141 Walker Street
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North Sydney NSW 2060
Australia
Tel: +61 2 8907 9000
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15 August 2014

RPS Group
PO Box 428
Hamilton NSW 2303
Attention: Stuart Greville

Our Ref: AA002967-56

Cooranbong Local Water Centre – Review of Potential Flood Impacts

Dear Stuart

The Cooranbong Local Water Centre (LWC) is proposed to provide water recycling services to the North Cooranbong precinct. Secretary's Environmental Assessment Requirements (SEARs) have been issued (refer **Appendix A**) by the Department of Planning and Environment (DPE) for the preparation of an Environmental Impact Statement (EIS) to assess the proposal.

Hyder Consulting has been engaged by RPS Australia East Pty Ltd (RPS) to address the SEARs in relation to flooding to inform the preparation of the EIS.

Specifically, the SEAR relating to flooding is:

> "***Flooding*** *– flood impacts to and from the facility, including constraints to detailed design and impacts on the operation of the infrastructure, and contingency measures in the event of operational impacts due to flooding*".

1. SITE DESCRIPTION

The proposed Cooranbong LWC is to be located upon part of Lot 12 DP 1158508, No. 617 Freemans Drive, Cooranbong. The site naturally falls to the south into Sandy Creek, a tributary of Dora Creek as shown in **Figure 1**.

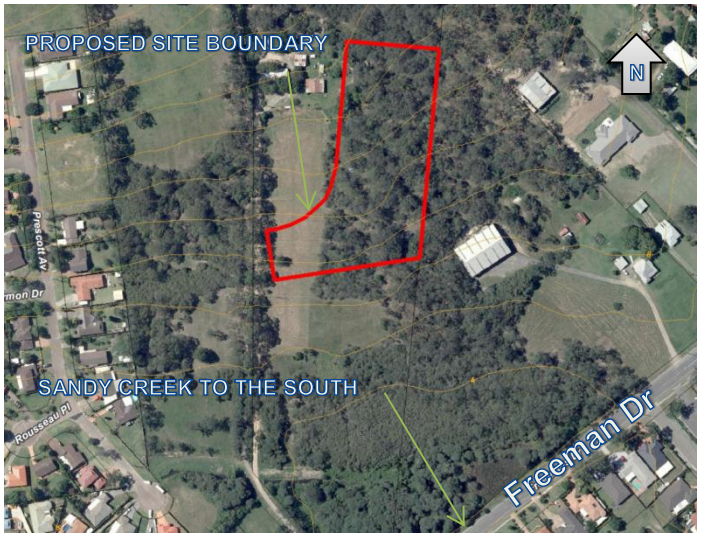

Figure 1: Site Locality Plan (Not To Scale)

2. FLOOD IMPACTS

Hyder's assessment in relation to flooding has included the following:

2.1 Impacts to the Facility

Standard practice in NSW, as detailed in the NSW Floodplain Development Manual (DIPNR, 2005), is to adopt a flood planning level (FPL) of 0.5 m above the 1% Annual Exceedance Probability (AEP) flood level. In order to determine the 1% AEP flood level a flood study is typically required.

Several flood studies have been prepared for the area surrounding the proposed water treatment plant:

- Flood and Drainage Assessment – Freemans Drive, Cooranbong (PPK, 2002)
- Flood Investigation Assessment for North Cooranbong Investigation Area (Northrop, 2005)
- North Cooranbong Flooding and Stormwater Master Plan (Hyder Consulting, 2008)

These studies have highlighted localised flooding to the south of the site towards Freemans Drive. The PPK study (2002) showed water ponding in this location up to R.L 5.9 in the 1% AEP event. This work was continued by Northrop (2005) which concluded that the ponding reached R.L 4.2 in the 1% AEP event.

Hyder Consulting's study (2008) was undertaken to inform the design of a regional detention system for development of the North Cooranbong Precinct and, while the study did not extend as far south as the proposed water recycling facility, it found flows to be similar to those reported by Northrop (2005). This provides some level of confidence in the 1% AEP flood level reported by Northrop of R.L 4.2.

As the proposed water recycling facility is at R.L 8.0 at its lowest point, assuming local overland flows are contained within the road reserve along the western edge of the site, it is concluded that there are no impacts on the site due to flooding in the 1% AEP event.

No information has been found on the Probable Maximum Flood (PMF) levels at the facility. However, given the significant difference between the lowest point in the facility (R.L. 8.0) and the most recent estimate of the 1% AEP level (R.L. 4.2) it is considered unlikely the PMF level would impact the facility.

2.2 Impacts from the Facility

Impacts from the facility can be measured as any change to the flood levels in properties adjacent to the proposed development and again it is standard practice in NSW for this impact to be measured for events up to the 1% AEP event.

The facility itself drains into a regional detention basin directly to the south, as shown on the Northrop drawing in **Appendix B**. Assuming this basin has been sized to incorporate the proposed development it will provide sufficient storage and have an appropriate outlet structure to limit discharge to pre-development levels in all events up to and including the 1% AEP event. This means that there would be no flooding impacts from the facility.

2.3 Constraints and Impacts of Flooding on the Infrastructure

As there are no impacts to or from the facility in terms of flooding, there are also no constraints imposed on the detailed design of operation of the facility. In an extreme flood event, evacuation could proceed safely to the higher ground to the north of the site.

CONCULSION

The flooding impacts to and from the facility and the design constraints imposed by them have been assessed and found to be negligible. As such it is considered that the SEAR has been addressed.

Yours sincerely

David Stone
Drainage Team Leader
02 8907 2894

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Appendix A

SEARs

ATTACHMENT 1

Secretary's Environmental Assessment Requirements

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

Proposal	Water recycling facility at Cooranbong, within the Lake Macquarie local government area
Location	617 Freemans Drive, Cooranbong NSW 2265; lot 12 DP 1158508
Applicant	Johnson Property Group
Date of Issue	10 June 2014
General Requirements	The Environmental Impact Statement (EIS) must meet the minimum form and content requirements in clauses 6 and 7 of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*.
Key Issues	The EIS must assess the following potential impacts of the proposal: ▪ **A detailed description of project** ▪ **Project justification** – including alternative sites and technologies; ▪ **Land use** – detail the impact on and from surrounding current and future land uses, including issues relating to managed adjoining areas and an analysis of site suitability with respect to potential land use conflicts. This assessment must consider the odour and visual amenity impact on the proposed water recycling facility on future residential land uses, and the impact of the proposal on future employment land within the Cooranbong site. The assessment must also consider all planning agreements applicable to the site; ▪ **Flora and fauna** – impacts on terrestrial, riparian and aquatic flora and fauna and habitat, and groundwater dependent ecosystems, within and surrounding the proposed development footprint, taking into account threatened species, ecological communities and critical habitat listed under the *Threatened Species Conservation Act 1995* and *Fisheries Management Act 1994,* including consideration of activities requiring approval or concurrence under the *Fisheries Management Act 1994*. Offset requirements must be considered as part of the assessment. The assessment must also take into any existing Species Impact Statement(s) relevant to the proposal area; ▪ **Heritage** – impacts on both Aboriginal cultural heritage and non-Aboriginal heritage; ▪ **Surface and groundwater hydrology** – impacts on creeks and waterways, including potential impacts on groundwater levels, salinity, and including potential contamination of groundwater, flooding impacts, and downstream water quality. This assessment must include likely application rates and precautionary discharges and overflows, and a water balance assessment showing the movement of water and impacts, including those to groundwater during wet and dry periods. The assessment must include a concept stormwater plan including surface water drainage patterns; ▪ **Flooding** – flood impacts to and from the facility, including constraints to detailed design and impacts on the operation of the infrastructure, and contingency measures in the event of operational impacts due to flooding; • **Soil and water quality** – detail the potential occurrence of contaminated soils and likely impacts from the disturbance of those soils, including impacts on water quality. This must include an assessment of contamination resulting from the proposal. The assessment must detail what the potential for contamination will be and the water quality expected to be output by the facility; • **Waste generation and hazards** – include an assessment of the waste generated by the facility, what chemicals would be used and stored on the site, assessment of hazards and risk including details of the waste handling and disposal or

	chemicals during construction and operation and identification of management measures associated with operation; • **Human health** – the assessment must identify any change to risk to human health from the output of the facility, including mitigation measures and management to ensure appropriate standards are met; • **Air Quality** – include an assessment of the odour impacts associated with operation of the WRF, prepared by an appropriately qualified person. The odour analysis shall be undertaken in accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (DEC, 2005) and draft *NSW Best Practice Odour Guideline Sewerage systems including sewage treatment plants, water recycling facilities, sewage reticulation systems and sewer mining* (DoP 2010), dust impacts to nearby receivers should be assessed; • **Noise and vibration** – detail the likely impacts during construction and operation (from construction machinery and haulage vehicles); • **Traffic** – include an assessment of impacts to the local road network, including direct impacts from construction or operational traffic; • **Visual Amenity** – include an assessment of changes to visual amenity, with reference to surface components and vegetation removal and include proposed mitigation measures, including proposed landscaping and other visual screening; and • **Environmental Monitoring and Management** – the EIS must describe in detail what measures would be implemented to manage, mitigate or offset the potential impacts of the proposal (as identified above) during construction and operation as relevant, and where required, describe how the environmental performance of the proposal would be monitored and managed over time. Where possible, reasonable and feasible mitigation measures should be developed in consultation with surrounding affected landowners and relevant public authorities.
Planning Documents and Environmental Planning Instruments	The EIS must assess the proposal against the relevant legislation, planning documents and environmental planning instruments, including, but not limited to: • *State Environmental Planning Policy (Infrastructure) 2007;* • *State Environmental Planning Policy No 55 – Remediation of Land*; • *State Environmental Planning Policy No 33 – Hazardous or Offensive Development;* • *Lake Macquarie Local Environmental Plan 200;* • *Draft Lake Macquarie Local Environmental Plan 2014;* • *Lake Macquarie Development Control Plan; and* • *Lake Macquarie Draft Development Control Plan 2014.*
Guidelines	It is recommended that during the preparation of the EIS you consider the following listed guidelines, studies and policies, and any other relevant documents discovered during the preparation of the EIS. 1. *EIS Guidelines – Sewerage Systems (*DUAP, 1996); 2. *Australian Water Quality Guidelines for Fresh and Marine Waters* (ANZECC 2000); 3. *NSW Aquifer Interference Policy* (DPI, 2013); 4. *Interim Construction Noise Guidelines* (DECC 2009) and *Industrial Noise Policy* (EPA, 2000); 5. *Threatened Species Assessment Guidelines: The Assessment of Significance* (DECC 2007); 6. Draft *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (DEC, 2005) and *NSW Heritage Manual* (DUAP, 1996);

	7. *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (DEC, 2005) and draft *NSW Best Practice Odour Guideline Sewerage systems including sewage treatment plants, water recycling facilities, sewage reticulation systems and sewer mining* (DoP 2010); and 8. *Crime Prevention and the Assessment of Development Applications* (DUAP, 2001).
Plans and Documents	The EIS must include all relevant plans, diagrams and relevant documentation required under Schedule 1 of the Regulation. These items are to be provided as part of the EIS rather than as separate documents.
Consultation	You must undertake an appropriate and justified level of consultation with relevant parties during the preparation of the EA, including: ▪ local, State or Commonwealth government authorities and service providers including NSW Health, the Environment Protection Authority, the Office of Environment and Heritage, the Department of Primary Industries (including the NSW Office of Water), local catchment management authority, Hunter Water, the Mines Subsidence Board, Roads and Maritime Services and Lake Macquarie City Council; ▪ specialist interest groups, including local Aboriginal land councils; and ▪ the local community, including affected landowners. The EA must describe the consultation process, document consultation undertaken and identify any issues raised (including where these have been addressed in the EA).
Further Consultation After Two Years	You should note that if the Development Application to which these requirements relate is not made within two years of the date of issue, you must re-consult with the Secretary prior to lodging the application.
Administration	In accordance with Section 113 of the EP&A Act, Council must ensure that copies of the EIS are exhibited at the Department's offices.

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Australia
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Appendix B

Concept Stormwater Management Plan Drawing (Northrop)

DENOTES PROPOSED DIRECTION OF FALL IN FINISHED SURFACE

Provide Earthern Mound to Disperse Runoff Across the Site Boundary to the Adjacent Vegetation Corridor

Provide Diversion Swale Upstream of Site Infrastructure

Max 2m Retaining Wall

Connect Drainage Swale to Proposed Detention Basin. Provide Erosion Protection as Required. Details to be Provided at CC Stage.

RL 11.00

4m FIRE TRAIL

RL 11.15

Local Water Centre

RL 11.35

RL 13.00

RL 11.25

RL 11.30

PAD RL = 13.10

FFL = 13.10

LANDSCAPE BUFFER

PAD RL = 13.10

4m FIRE TRAIL

Ramp @ 7% Max

LANDSCAPE BUFFER

Batter at Max 1:3

EX RL 51.50

Max 1.2m Retaining Wall

15m

PAD RL = 8.30

RL 8.20

Infrastructure To Be Confirmed

PAD RL = 8.30

10m

Ramp @ 10% Max

Proposed Culvert

EX RL 11.00

STORMWATER DETENTION BASIN - 3600m2 Total area

1:100 FLOOD LEVEL

Connect Drainage Swale to Proposed Detention Basin. Provide Erosion Protection as Required. Details to be Provided at CC Stage.

DRAWN A.Knight
DESIGNED A.Knight
JOB MANAGER A.Brown
VERIFIER A.Brown

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR INFORMATION	AK	AB	AK	22.05.14
2	RE-ISSUED FOR INFORMATION	AK	AB	AK	29.05.14
A	ISSUED FOR APPROVAL	AK	AB	AK	06.06.14

CLIENT: RPS AUSTRALIA ASIA PACIFIC

ARCHITECT: PERMEATE PARTNERS

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ALL SETOUT TO ARCHITECT'S DRAWINGS. DIMENSIONS TO BE VERIFIED WITH THE ARCHITECT AND ON SITE BEFORE MAKING SHOP DRAWINGS OR COMMENCING WORK. NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.

SCALE 1:500 @ A3

NORTHROP
Newcastle
Suite 4, 215 Pacific Hwy, Charlestown NSW 2290
P.O. Box 180, Charlestown NSW 2290
Ph (02) 4943 1777 Fax (02) 4943 1577
Email newcastle@northrop.com.au ABN 81 094 433 100

PROJECT: COORANBONG LOCAL WATER CENTRE

DRAWING TITLE: CONCEPT STORMWATER MANAGEMENT PLAN

JOB NUMBER: NL140143

DRAWING NUMBER: CSK2

REVISION: A

DRAWING SHEET SIZE = A1

Appendix 7

Preliminary Geotechnical and Preliminary Contamination Assessments

Report on Preliminary Geotechnical Investigation

Water Recycling Facility
617 Freeman's Drive Cooranbong

CGS2276

Prepared for
Johnson Property Group Pty Ltd

August 2014

Cardno Geotech Solutions
Shaping the Future

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0	08/08/14	Initial issue	PB		IGP	

Version	Reason for Issue	Approved for Release By	Approved (Signature)	Approved Release Date
0	First issue to client	IGP		08/08/14

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Appendices

1 Introduction

This report presents the results of a preliminary geotechnical investigation undertaken by Cardno Geotech Solutions (CGS) at the request of Mr Jason McIntosh on behalf of Johnson Property Group Pty Ltd for construction of a Water Recycling Facility at 617 Freeman's Drive Cooranbong.

The report describes surface and subsurface conditions encountered at the site and provides preliminary geotechnical assessment and advice on earthworks and foundation design.

For the purpose of this report a layout plan by Permeate Partners, referenced C14107–P050 Rev 1, was provided by the client. It is noted that the supplied plan provided suggest locations for geotechnical investigation, however the method of assessment would need to consider the likely subsurface conditions i.e. where deep alluvial soils were present. As a preliminary assessment utilisation of available plant was undertaken to conduct limit geotechnical assessment by test pitting to ascertain whether deeper investigation methods would be required. The limited test pitting identified a predominately subsurface residual soil profile thus negating the need for deeper assessment given the relatively lightly loaded commercial development. If required, and given the need for earthworks to reach design levels more detailed investigation could be undertaken as part of detailed design.

It is understood that the proposed water recycling plant comprises several lightly loaded structures to house the water treatment facility and several large storage tanks.

2 Site Description

The site is identified as Lot 617 Freemans Drive, Cooranbong as shown on the attached Drawing CGS2276-004-d1. The site is generally bushland with the south west portion partially cleared. The site is bounded by bushland to the north south and east and has cleared open space to the west.

Topographically the site is located on the southern slope of a broad east-west trending ridgeline and slopes to the south at approximately 6°. Drainage would be expected to comprise surface runoff following the natural contours of the site to the south.

3 Investigation Methodology

The field investigation was conducted on 16 June 2014 by a Principal Technical Officer from CGS, using a 3.5t excavator equipped with a 450mm toothed bucket, and comprised excavation of three (3) Test Pits (TP001 – TP003) to target depths of 1.5 or prior refusal. Dynamic Cone Penetrometer (DCP) testing was conducted adjacent the bores by a Senior Laboratory Technician to aid in the assessment of the subsurface strength conditions.

Details of the subsurface conditions encountered are given in Section 4.2 and detailed on the engineering logs attached in Appendix B together with explanatory notes. The bores were located with reference to existing site features as shown on Drawing CGS2276-004-d1 attached in Appendix A.

4 Investigation Findings

4.1 Published Data

Reference to the 1:100,000 Newcastle Coalfield Regional Geology Map [1] indicate that the site is situated within the Munmorah Conglomerate of the Narrabeen Group. The subgroup typically comprises conglomerate, pebbly sandstone and grey to green shale and residual soils derived therefrom.

4.2 Subsurface Conditions

The subsurface conditions encountered in the bores drilled across the Lots comprised:

> Silty Sand Topsoil to between 0.1 to 0.2m overlying;

> Clayey Sand to between 0.5 and 0.7m depth overlying;

> Silty Sandy Clay to at least 1.5m.

Some evidence of weathered rock was observed at the base (1.5m depth) of TP001.

Penetrometer testing indicates the clayey Sand is loose to medium dense and the silty sandy Clay is of a stiff to hard consistency and was assessed to be above the plastic limit at the time of fieldwork.

No groundwater or seepage was encountered in the bore at the time of fieldwork; however, it should be noted that groundwater levels are likely to fluctuate with variations in climatic and site conditions.

5 Comments and Recommendations

5.1 Footings

Shallow footings should be founded below the Silty Sand topsoil layer preferably at a minimum depth of 0.5m. Any deleterious soils or uncontrolled fill if encountered during excavation should be removed, reconditioned and replaced. All footings for the same structure should be founded on strata of similar stiffness and reactivity to minimise the risk of differential movements.

While not specifically appropriate for foundation design for other than residential structures the use of design procedures nominated within AS 2870-20011 can be considered where the proposed development is consistent with lightly loaded structures. Given the proposed development it is recommended that the foundations for the proposed lightly loaded structures be designed in accordance with the requirements of AS2870-2011 [2].

5.1.1 High-Level Footings

High-level footing alternatives could be expected to comprise slabs on ground with edge beams or pad footings for the support of concentrated loads. Such footings designed in accordance with engineering principles and founded in stiff to very stiff (minimum undrained cohesion of 75kPa) or better natural soils (below topsoil, uncontrolled fill or other deleterious material) or in controlled fill (placed and compacted in accordance with AS3798-2007 [3]) may be proportioned on an allowable bearing capacity of 150kPa. The founding conditions should be assessed by a geotechnical consultant or experienced engineer to confirm suitable conditions.

5.1.2 Piered/Piled Footings

Piered footings are considered as an alternative to deep edge beams or high level footings. It is suggested that piered footings, founded in stiff to very stiff (minimum undrained cohesion of 75kPa) or better clay soils or controlled fill could be proportioned on an end bearing pressure of 300kPa based on a minimum founding depth of 2m. Where piered footing are utilised, the potential for volume change in the subsurface profile should be taken into considered by the designer.

All footings should be founded below any topsoil, deleterious soils or uncontrolled fill. All footings for the same structure should be founded on strata of similar stiffness and reactivity to minimise the risk of differential movements.

Inspection of pier/piled footings excavations should be undertaken to confirm the founding conditions and the base should be cleared of fall-in prior to the formation of the footing.

5.2 Excavations

Practical machine bucket refusal was encountered at between 1.2 and 1.5m depth at the test pit locations, excavations could be undertaken to the depths shown on the report log sheets using conventional earthmoving equipment such as backhoes and excavators. Excavatability conditions have not been assessed beyond the depths to which the test pits were excavated.

Excavations or trenches in the residual clayey soils could be expected to stand close to vertical in the short-term. Unsupported short-term excavations or trenches may undergo some local slumping into the excavation where seepage or high groundwater levels occur or where sandy layers or zones occur within the soil or extremely weathered decomposed rock profile.

It is recommended that long-term excavations should be either battered at 2H:1V or flatter and protected against erosion or be supported by engineer designed and suitably constructed retaining walls. Excavations may be battered steeper than 2H:1V in rock materials, subject to specific geotechnical assessment.

5.3 Filling

Materials excavated on site with the exception of topsoil, silt and other deleterious materials, are considered suitable for re-use as engineering fill. The materials may require treatment or moisture re-conditioning, subject to further assessment and weather conditions prior to and during construction.

Fill should be placed and compacted in accordance with AS 3798-2007, Guidelines on Earthworks for Commercial and Residential Development [3]. It is expected that construction of a suitable berm or fill platform would include the following:

> Removal of any existing fill, topsoil or deleterious soils from areas where fill is to be placed.

> Benching of the exposed subgrade slope in the area where fill is to be placed if slopes are steeper than 8H:1V (approximately 7°).

> Proof rolling of the exposed subgrade to detect any weak or deforming areas of subgrade that should be excavated and replaced with compacted fill.

> Placement of fill in horizontal layers with compaction of each layer to a minimum dry density ratio of 98% Standard Compaction.

All fill should be supported by properly designed and constructed retaining walls or else battered at a slope of 2H:1V or flatter and protected against erosion by vegetation or similar and the provision of adequate drainage.

5.4 Basin Construction

Clay materials encountered on site are likely to generally suitable for the construction of the proposed basin; however, subject to permeability and Emerson class testing, they may require amelioration with gypsum to control dispersion.

The clayey sand encountered on site is unlikely to have a suitable permeability for basin construction and will require lining with suitable site clays or suitable geosynthetic where it is exposed in the basin profile.

It is understood that the proposed basin will incorporate a geosynthetic liner and as such the properties of the soil required to create the basin become largely redundant.

6 Conclusions

The investigation revealed a subsurface profile generally comprising silty sand topsoil overlying clayey Sand and residual silty sandy Clays grading to potential weathered rock.

Footings founded in controlled fill or natural and founded in stiff to very stiff (minimum undrained cohesion of 75kPa) may be proportioned on an allowable bearing pressure of 150kPa. Piered footings founded in controlled and founded in stiff to very stiff (minimum undrained cohesion of 75kPa) could be proportioned on an allowable bearing pressure of 300kPa if founded at a minimum depth of 2m. Inspection of footings by a geotechnical consultant or experienced engineer is required to provide confirmation of founding conditions.

Materials excavated on site with the exception of topsoil, silt and other deleterious materials, are considered suitable for re-use as engineering fill.

There were no significant geotechnical constraints to the proposed development encountered on the site during the investigation. It is noted that several large tanks will be constructed as part of the development which may be sensitive to differential movement. It is recommend that additional assessment would be prudent in the specific location of the tanks to assess any design issues arising from the existing conditions and proposed earthworks.

7 Limitations

Cardno Geotech Solutions (CGS) have performed investigation and consulting services for this project in general accordance with current professional and industry standards. The extent of testing was limited to discrete test locations and variations in ground conditions can occur between test locations that cannot be inferred or predicted.

A geotechnical consultant or qualified engineer shall provide inspections during construction to confirm assumed conditions in this assessment. If subsurface conditions encountered during construction differ from those given in this report, further advice shall be sought without delay.

Cardno Geotech Solutions, or any other reputable consultant, cannot provide unqualified warranties nor does it assume any liability for the site conditions not observed or accessible during the investigations. Site conditions may also change subsequent to the investigations and assessment due to ongoing use.

This report and associated documentation was undertaken for the specific purpose described in the report and shall not be relied on for other purposes. This report was prepared solely for the use by Johnson Property Group Pty Ltd and any reliance assumed by other parties on this report shall be at such parties own risk.

References

[1] *Newcastle Coalfield Regional 1:100 000 Geology Map, "Geological Series Sheet 9231, and part of 9131, 9132 and 9232 (Edition 1)," Geological Survey of NSW, Department of Mineral Resources, 1995.*

[2] Australian Standard AS3798-2007, "Guidelines on Earthworks for Commercial and Residential Structures," Standards Australia, 2007.

[3] Australian Standard AS2870-2011, "Residential Slabs and Footings," Standards Australia, 2011.

APPENDIX A
DRAWINGS

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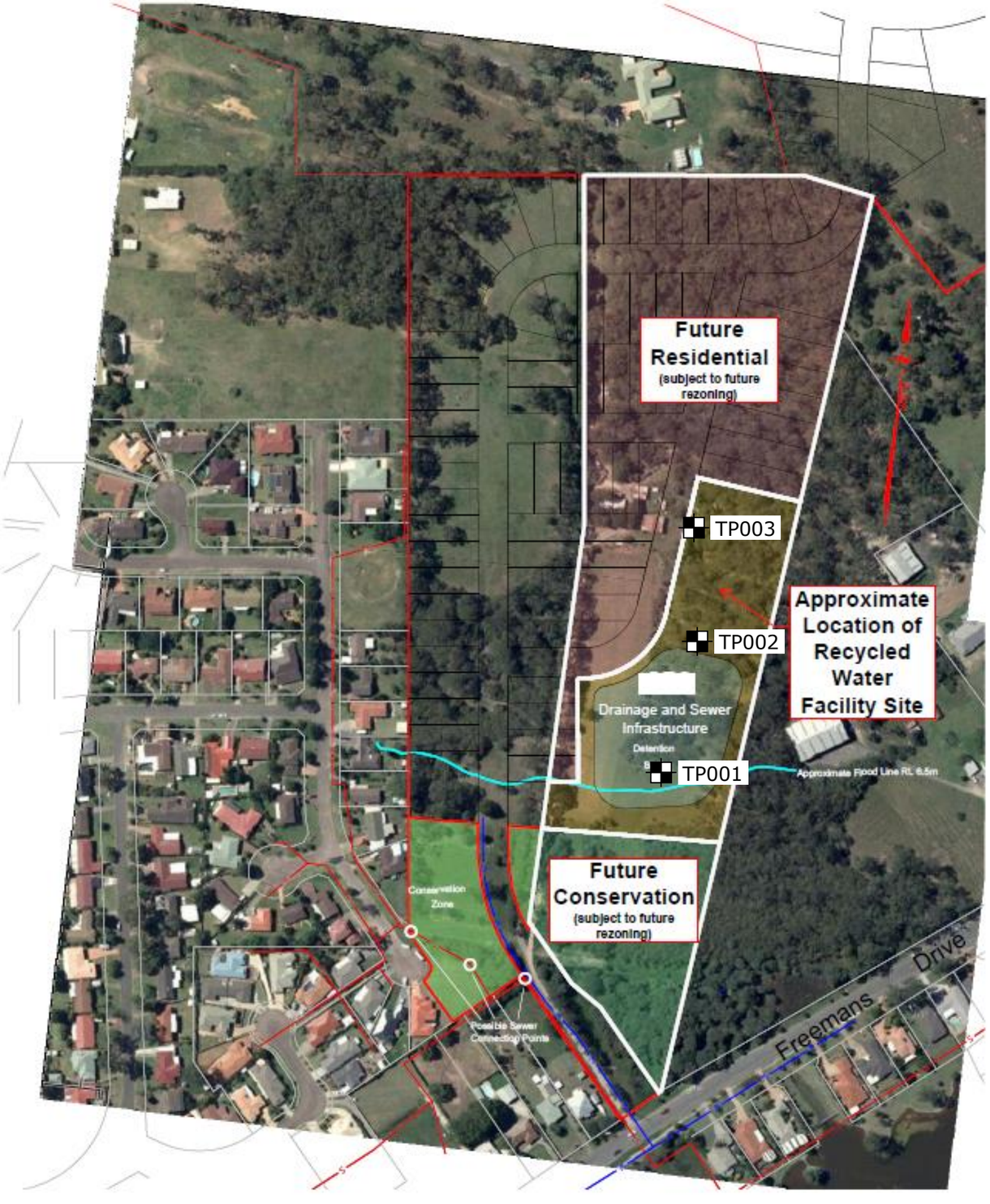

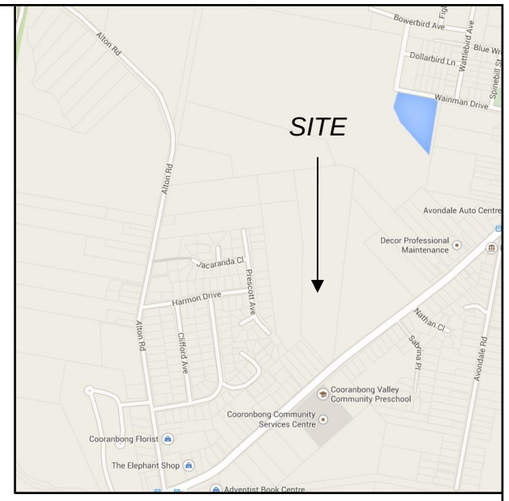

NOTES:

Drawing adapted from Johnson Property Group "Construction and operation of an onsite sewerage system with a capacity greater than 2,500 persons", 617 Freemans Drive, Cooranbong (Lot 12, DP1158508).

Drawing is not to scale

LEGEND:

Approximate test pit locations and numbers

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DRAWING TITLE:	TEST PIT LOCATION PLAN
PROJECT NAME:	PRELIMINARY GEOTECHNICAL INVESTIGATION
SITE LOCATION:	617 FREEMANS DRIVE, COORANBONG

CLIENT:	Johnson Property Group Pty Ltd
PROJECT NO:	CGS2276
DRAWING NO:	1
FILE REF:	CGS2276-004-d1r1

DRAWN BY:	DS
CHECKED BY:	IGP
OFFICE:	4/5 Arunga Drive, Beresfield NSW 2322
DATE:	7 August 2014

APPENDIX B
ENGINEERING LOGS

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Explanatory Notes

The methods of description and classification of soils and rocks used in this report are based on *Australian Standard 1726 Geotechnical Site Investigations Code.* Material descriptions are deduced from field observation or engineering examination, and may be appended or confirmed by in situ or laboratory testing. The information is dependent on the scope of investigation, the extent of sampling and testing, and the inherent variability of the conditions encountered.

Subsurface investigation may be conducted by one or a combination of the following methods.

Method	
Test Pitting: excavation/trench	
BH	Backhoe bucket
EX	Excavator bucket
X	Existing excavation
Natural Exposure: existing natural rock or soil exposure	
Manual drilling: hand operated tools	
HA	Hand Auger
Continuous sample drilling	
PT	Push tube
Hammer drilling	
AH	Air hammer
AT	Air track
Spiral flight auger drilling	
AS	Large diameter short spiral auger
AD/V	Continuous spiral flight auger: V-Bit
AD/T	Continuous spiral flight auger: TC-Bit
Rotary non-core drilling	
WS	Washbore (mud drilling)
RR	Rock roller
Rotary core drilling	
HQ	63mm diamond-tipped core barrel
NMLC	52mm diamond-tipped core barrel
NQ	47mm diamond-tipped core barrel
Concrete coring	
DT	Diatube

Sampling is conducted to facilitate further assessment of selected materials encountered.

Sampling method	
Disturbed sampling	
B	Bulk disturbed sample
D	Disturbed sample
ES	Environmental soil sample
Undisturbed sampling	
SPT	Standard Penetration Test sample
U#	Undisturbed tube sample (#mm diameter)
Water samples	
EW	Environmental water sample

Field testing may be conducted as a means of assessment of the in-situ conditions of materials encountered.

Field testing	
SPT	Standard Penetration Test (blows/150mm)
HP/PP	Hand/Pocket Penetrometer
Dynamic Penetrometers (blows/150mm)	
DCP	Dynamic Cone Penetrometer
PSP	Perth Sand Penetrometer
VS	Vane Shear
PBT	Plate Bearing Test

If encountered with SPT or dynamic penetrometer testing, refusal (R), virtual refusal (VR) or hammer bouncing (HB) may be noted.

The quality of the rock can be assessed be the degree of fracturing and the following.

Rock quality description	
TCR	Total Core Recovery (%) (length of core recovered divided by the length of core run)
RQD	Rock Quality Designation (%) (sum of axial lengths of core greater than 100mm long divided by the length of core run)

Notes on groundwater conditions encountered may include.

Groundwater	
Not Encountered	Excavation is dry in the short term
Not Observed	Groundwater observation not possible
Seepage	Groundwater seeping into hole
Inflow	Groundwater flowing/flooding into hole

Perched groundwater may result in a misleading indication of the depth to the true water table. Groundwater levels are likely to fluctuate with variations in climatic and site conditions.

Notes on the stability of excavations may include.

Excavation conditions	
Spalling	Material falling into excavation, may be described as minor or major spalling
Unstable	Collapse of the majority, or one or more face, of the excavation

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Explanatory Notes - General Soil Description

The methods of description and classification of soils used in this report are based on *Australian Standard 1726 Geotechnical Site Investigations Code.* In practice, if the material can be remoulded by hand in its field condition or in water it is described as a soil. The dominant soil constituent is given in capital letters, with secondary textures in lower case. In general, descriptions cover: soil type, strength / relative density, moisture, colour, plasticity and inclusions.

Soil types are described according to the dominant particle size on the basis of the following assessment.

Soil Classification		Particle Size
CLAY		< 0.002mm
SILT		0.002mm 0.075mm
SAND	*fine*	0.075mm to 0.2mm
	medium	0.2mm to 0.6mm
	coarse	0.6mm to 2.36mm
GRAVEL	*fine*	2.36mm to 6mm
	medium	6mm to 20mm
	coarse	20mm to 63mm
COBBLES		63mm to 200mm
BOULDERS		> 200mm

Soil types are qualified by the presence of minor components on the basis of field examination or grading.

Description	Percentage of minor component
Trace	< 5% in coarse grained soils
	< 15% in fine grained soils
With	5% to 12% in coarse grained soils
	15% to 30% in fine grained soils

The strength of cohesive soils is classified by engineering assessment or field/laboratory testing as follows.

Strength	Symbol	Undrained shear strength
Very Soft	VS	< 12kPa
Soft	S	12kPa to 25kPa
Firm	F	25kPa to 50kPa
Stiff	St	50kPa to 100kPa
Very Stiff	VSt	100kPa to 200kPa
Hard	H	> 200kPa

Cohesionless soils are classified on the basis of relative density as follows.

Relative Density	Symbol	Density Index
Very Loose	VL	< 15%
Loose	L	15% to 35%
Medium Dense	MD	35% to 65%
Dense	D	65% to 85%
Very Dense	VD	> 85%

The moisture condition of soil is described by appearance and feel and may be described in relation to the Plastic Limit (PL) or Optimum Moisture Content (OMC).

Moisture condition and description	
Dry	Cohesive soils; hard, friable, dry of plastic limit. Granular soils; cohesionless and free-running
Moist	Cool feel and darkened colour: Cohesive soils can be moulded. Granular soils tend to cohere
Wet	Cool feel and darkened colour: Cohesive soils usually weakened and free water forms when handling. Granular soils tend to cohere

The plasticity of cohesive soils is defined as follows.

Plasticity	Liquid Limit
Low plasticity	≤ 35%
Medium plasticity	> 35% ≤ 50%
High plasticity	> 50%

The structure of the soil may be described as follows.

Zoning	Description
Layer	Continuous across exposure or sample
Lens	Discontinuous layer (lenticular shape)
Pocket	Irregular inclusion of different material

The structure may include; defects such as softened zones, fissures, cracks, joints and root-holes; and coarse grained soils may be described as strongly or weakly cemented.

The soil origin may also be noted if possible to deduce.

Soil origin and description	
Fill	Man-made deposits or disturbed material
Topsoil	Material affected by roots and root fibres
Colluvial soil	Transported down slopes by gravity
Aeolian soil	Transported and deposited by wind
Alluvial soil	Deposited by rivers
Lacustrine soil	Deposited by lakes
Marine soil	Deposits in beaches, bays, estuaries
Residual soil	Developed on weathered rock

The origin of the soil generally cannot be deduced on the appearance of the material and may be assumed based on further geological evidence or field observation.

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Explanatory Notes - General Rock Description

The methods of description and classification of rocks used in this report are based on *Australian Standard 1726 Geotechnical Site Investigations Code.* In general, if a material cannot be remoulded by hand in its field condition or in water it is described as a rock, is classified by its geological terms. In general, descriptions cover: rock type, degree of weathering, strength, colour, grain size, structure and minor components or inclusions.

Sedimentary rock types are generally described according to the predominant grain size as follows.

Rock Type	Description
CONGLOMERATE	Rounded gravel sized fragments >2mm cemented in a finer matrix
SANDSTONE	Sand size particles defined by grain size and often cemented by other materials *fine* 0.06mm to 0.2mm *medium* 0.2mm to 0.6mm *coarse* 0.6mm to 2mm
SILTSTONE	Predominately silt sized particles
SHALE	Fine particles (silt or clay) and fissile
CLAYSTONE	Predominately clay sized particles

The classification of rock weathering is described based on definitions outlined in AS1726 as follows.

Term and symbol		Definition
Residual Soil	RS	Soil developed on extremely weathered rock; mass structure and substance are no longer evident
Extremely weathered	XW	Weathered to such an extent that it has 'soil' properties
Distinctly weathered	DW	Strength usually changed and may be highly discoloured. Porosity may be increased by leaching, or decreased due to deposition in pores
Slightly weathered	SW	Slightly discoloured; little/no change of strength from fresh rock
Fresh Rock	FR	Rock shows no sign of decomposition or staining

Rock material strength (distinct from mass strength which can be significantly weaker due to the effect of defects) can be defined based on the point load index as follows.

Term and symbol		Point Load Index I_s50
Extremely low	EL	< 0.03MPa
Very Low	VL	0.03MPa to 0.1MPa
Low	L	0.1MPa to 0.3MPa
Medium	M	0.3MPa to 1MPa
High	H	1MPa to 3MPa
Very High	VH	3MPa to 10MPa
Extremely High	EH	> 10MPa

For preliminary assessment and in cases where no point load testing is available, the rock strength may be assessed using the field guide specified by AS1726.

The defect spacing and bedding thickness of rocks, measured normal to defects of the same set or bedding, can be described as follows.

Definition	Defect Spacing
Thinly laminated	< 6mm
Laminated	6mm to 20mm
Very thinly bedded	20mm to 60mm
Thinly bedded	60mm to 0.2m
Medium bedded	0.2m to 0.6m
Thickly bedded	0.6m to 2m
Very thickly bedded	> 2m

Defects in rock mass are often described by the following.

Terms			
Joint	JT	Sheared zone	SZ
Bed Parting	BP	Sheared surface	SS
Contact	CO	Seam	SM
Dyke	DK	Crushed Seam	CS
Decomposed Zone	DZ	Infilled Seam	IS
Fracture	FC	Foliation	FL
Fracture Zone	FZ	Vein	VN

The shape and roughness of defects are described using the following terms.

Planarity		Roughness	
Planar	PR	Very Rough	VR
Curved	CU	Rough	RF
Undulating	U	Smooth	S
Irregular	IR	Polished	POL
Stepped	ST	Slickensides	SL

The coating or infill associated with defects can be described as follows.

Definition	Description
Clean	No visible coating or infilling
Stain	No visible coating or infilling; surfaces discoloured by mineral staining
Veneer	Visible coating or infilling of soil or mineral substance (<1mm). If discontinuous over the plane; patchy veneer
Coating	Visible coating or infilling of soil or mineral substance (>1mm)

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Graphics Symbols Index

CLAYS


CLAY


Silty CLAY


Sandy CLAY


Gravelly CLAY

SILTS


Organic SILT


SILT


Clayey SILT


Sandy SILT


Gravelly SILT

SANDS


SAND


Clayey SAND


Silty SAND


Gravelly SAND

GRAVELS


GRAVEL


Clayey GRAVEL


Silty GRAVEL


Sandy GRAVEL


COBBLES & BOULDERS

MISCELLANEOUS


FILL


TOPSOIL


CONCRETE


ASPHALT


CORE LOSS


PAVEMENT GRAVEL


PAVEMENT (Natural Gravels)


PAVEMENT (Crushed Rock)

SEDIMENTARY ROCK


CONGLOMERATE


BRECCIA


SANDSTONE


SILTSTONE


SHALE


MUDSTONE / CLAYSTONE


COAL

METAMORPHIC ROCK


SLATE / PHYLLITE / SCHIST


GNEISS


QUARTZITE

IGNEOUS ROCK


GRANITE


BASALT


TUFF

TESTPIT LOG

CLIENT : Johnson Property Group Pty Ltd
PROJECT : Thompson Property Waste Water Treatment Facility
LOCATION : 617 Freemans Drive, Cooranbong

HOLE NO : TP001
PROJECT REF : CGS2276
SHEET : 1 OF 1

EQUIPMENT TYPE : 3.5t Excavator | METHOD : 450mm bucket
DATE EXCAVATED : 6/12/14 | LOGGED BY : IGP | CHECKED BY : PB
LOCATION : See Drawing for location

GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, plasticity or particle characteristic, colour Rock Type, grain size, colour Secondary and minor components	MOISTURE / WEATHERING	CONSISTENCY / REL DENSITY / ROCK STRENGTH	DYNAMIC PENETROMETER	HAND PENETRO-METER (kPa)	STRUCTURE & Other Observations
Not Encountered	0.30m ES-ES001 / QA001	0.0			TOSOIL, Silty SAND, fine grained, grey	M		2		
					0.15m Clayey SAND, fine grained, yellow-brown, low plasticity	M - W	L - MD	2 4		
		0.5			0.60m Sandy CLAY, medium plasticity, mottled red & yellow & brown, fine grained sand, trace silt	MC > PL	St	5 4 5 6		
		1.0			1.20m Sandy CLAY, medium plasticity, fine grained sand, mottled red & grey, trace silt	MC < PL	VSt	8 10 12		Some evidence of weathered rock structure observed at base of pit
		1.5			1.50m Testpit TP001 terminated at 1.50 m Target depth					
		2.0								

HAND PENETROMETER (kPa): 100, 200, 300, 400

WATER / MOISTURE
D - Dry
M - Moist
W - Wet
OMC - Optimum MC
PL - Plastic Limit
▶— Water inflow

SAMPLES & FIELD TESTS
U - Undisturbed Sample
D - Disturbed Sample
ES - Environmental sample
B - Bulk Disturbed Sample
SPT - Standard Penetration Test
HP - Hand/Pocket Penetrometer

CONSISTENCY
VS - Very Soft
S - Soft
F - Firm
St - Stiff
VSt - Very Stiff
H - Hard

RELATIVE DENSITY
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

ROCK STRENGTH
EL - Extremely low
VL - Very low
L - Low
M - Medium
H - High
VH - Very high
EH - Extremely high

ROCK WEATHERING
RS - Residual soil
XW - Extremely weathered
DW - Distinctly weathered
SW - Slightly weathered
FR - Fresh rock

See Explanatory Notes for details of abbreviations & basis of descriptions.

CARDNO GEOTECH SOLUTIONS

TESTPIT LOG

CLIENT : Johnson Property Group Pty Ltd
PROJECT : Thompson Property Waste Water Treatment Facility
LOCATION : 617 Freemans Drive, Cooranbong

HOLE NO : TP002
PROJECT REF : CGS2276
SHEET : 1 OF 1

EQUIPMENT TYPE : 12/6/2014 | METHOD : 450mm bucket

DATE EXCAVATED : 6/12/14 | LOGGED BY : IGP | CHECKED BY : PB

LOCATION : See Drawing for location

GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, plasticity or particle characteristic, colour Rock Type, grain size, colour Secondary and minor components	MOISTURE / WEATHERING	CONSISTENCY / REL DENSITY / ROCK STRENGTH	DYNAMIC PENETROMETER	HAND PENETRO-METER (kPa)	STRUCTURE & Other Observations
Not Encountered	0.30m ES-ES002	0.0			TOPSOIL, Silty SAND, fine grained, grey			3	100 200 300 400	DCP at Surface (Blows/150): 3,3,2,2,6,6,6,6,8,12
					0.20m Clayey SAND, fine grained, yellow-brown, low plasticity		L - MD	3		
		0.5						2		
								2		
					0.70m Sandy CLAY, medium plasticity, mottled red & grey, fine grained sand, trace silt		St - VSt	6		
		1.0						6		
								6		
					1.20m Testpit TP002 terminated at 1.20 m Target depth					
		1.5								
		2.0								

WATER / MOISTURE
D - Dry
M - Moist
W - Wet
OMC - Optimum MC
PL - Plastic Limit
▶— Water inflow

SAMPLES & FIELD TESTS
U - Undisturbed Sample
D - Disturbed Sample
ES - Environmental sample
B - Bulk Disturbed Sample
SPT - Standard Penetration Test
HP - Hand/Pocket Penetrometer

CONSISTENCY
VS - Very Soft
S - Soft
F - Firm
St - Stiff
VSt - Very Stiff
H - Hard

RELATIVE DENSITY
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

ROCK STRENGTH
EL - Extremely low
VL - Very low
L - Low
M - Medium
H - High
VH - Very high
EH - Extremely high

ROCK WEATHERING
RS - Residual soil
XW - Extremely weathered
DW - Distinctly weathered
SW - Slightly weathered
FR - Fresh rock

See Explanatory Notes for details of abbreviations & basis of descriptions.

CARDNO GEOTECH SOLUTIONS

TESTPIT LOG

CLIENT : Johnson Property Group Pty Ltd
PROJECT : Thompson Property Waste Water Treatment Facility
LOCATION : 617 Freemans Drive, Cooranbong

HOLE NO : TP003
PROJECT REF : CGS2276
SHEET : 1 OF 1

EQUIPMENT TYPE : 12/6/2014 | METHOD : 450mm bucket

DATE EXCAVATED : 6/12/14 | LOGGED BY : IGP | CHECKED BY : PB

LOCATION : See Drawing for location

GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, plasticity or particle characteristic, colour Rock Type, grain size, colour Secondary and minor components	MOISTURE / WEATHERING	CONSISTENCY / REL DENSITY / ROCK STRENGTH	DYNAMIC PENETROMETER	HAND PENETRO-METER (kPa)	STRUCTURE & Other Observations
Not Encountered	0.30m ES-ES003	0.0			TOPSOIL, Silty SAND, fine grained, grey	W		2	100 200 300 400	DCP at surface (blows/150): 2,2,4,5,4,5,6,8,10,12
		0.10m			Clayey SAND / Sandy CLAY, low to medium plasticity, fine grained sand, yellow-brown	M	L - MD	2 4		
		0.5			Silty Sandy CLAY, medium plasticity, grey-red, fine grained sand	MC > PL	St	5 4 5 6 8		
		1.20m			Testpit TP003 terminated at 1.20 m Target depth					
		1.0								
		1.5								
		2.0								

WATER / MOISTURE
D - Dry
M - Moist
W - Wet
OMC - Optimum MC
PL - Plastic Limit
▶— Water inflow

SAMPLES & FIELD TESTS
U - Undisturbed Sample
D - Disturbed Sample
ES - Environmental sample
B - Bulk Disturbed Sample
SPT - Standard Penetration Test
HP - Hand/Pocket Penetrometer

CONSISTENCY
VS - Very Soft
S - Soft
F - Firm
St - Stiff
VSt - Very Stiff
H - Hard

RELATIVE DENSITY
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

ROCK STRENGTH
EL - Extremely low
VL - Very low
L - Low
M - Medium
H - High
VH - Very high
EH - Extremely high

ROCK WEATHERING
RS - Residual soil
XW - Extremely weathered
DW - Distinctly weathered
SW - Slightly weathered
FR - Fresh rock

See Explanatory Notes for details of abbreviations & basis of descriptions.

CARDNO GEOTECH SOLUTIONS

Report on Preliminary Contamination Assessment

617 Freemans Drive, Cooranbong

CGS2276

Prepared for
Johnson Property Group

8 August 2014

Cardno Geotech Solutions
Shaping the Future

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Version	Reason for Issue	Approved for Release By	Approved (Signature)	Approved Release Date
0	Issue to client	IGP		08/08/14

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Appendices

Tables

1 Introduction

This report presents the results of Preliminary Contamination Assessment undertaken by Cardno Geotech Solutions (CGS) at 617 Freemans Drive, Cooranbong. It is understood that the development comprises a proposed waste water management facility located within the central western portion of the property.

The work was conducted at the request of Mr Jason McIntosh of Johnson Property Group Pty Ltd. The purpose of the investigation was to provide comment on the potential contamination status of the site as part of a separate rezoning and development applications to Lake Macquarie City Council (LMCC) to demonstrate whether the site is suitable for development from a contamination standpoint. The assessment was limited to the proposed footprint of the facility located within the central western portion of the site as shown on the attached drawing CGS2276-003-d1 and excludes the surrounding area.

For the purpose of this assessment, a layout plan by Permeate Partners, referenced C14107–P050 Rev 1, was provided by the client.

The assessment comprised of a desktop review, site inspection and targeted intrusive sampling. The results of the Preliminary Contamination are presented herein.

2 Site Description

The overall site is identified as Lot 12 DP 1158508, 617 Freemans Drive located at Cooranbong. The site is irregular in shape and is bounded by Freemans Drive to the south and existing residential development in the east, west and north.

At the time of fieldwork features and observations are as follows:

> Topographically the site is situated within gentle to moderate sloping terrain with site slopes falling towards the west / south-west at approximate gradients of 2º - 6º;

> A rural dam was located within the north-eastern portion of the site. It appears that the dam has been formed by excavation of the existing site soils. At the time of inspection the dam was holding water.

> Existing development was limited to an access track located on the western boundary of the site, a residential dwelling and several building structures located within the northern portion of the site;

> Vegetation across the site predominately comprised of dense tree cover and maintained grass cover located within the approximate centre of the site, near the existing residential dwelling.

> Drainage appears to be comprised of surficial flows / run off following the existing site contours and natural drainage lines.

This assessment was conducted only on part of the land which is subject to a proposed water recycling facility as shown in Appendix A.

3 Site History

To aid in determining site history a review of available information was undertaken which involved:

> Review of supplied historical aerial photographs for the area;

> Review of Lake Macquarie City Council (LMCC) records including S149 certificates; and

> Review of Public records maintained by the NSW EPA regarding notices made under the Contaminated Land Management Act 1997 and licenses issued under the Protection of the Environment (Operations) Act 1997.

3.1 Historical Aerial Photographs

A review of a range of available aerial photography indicated that site was predominately undeveloped. The ability to discern site features was limited due to the relatively small scale and poor resolution of some of the photographs. A summary of observed site features detailed in the reviewed aerial photographs are detailed in Table 3-1 and aerials are attached in appendix A.

Table 3-1 Aerial Photography Review

Date	Reference	Comments
1954	Department of Lands Scale: - B/W	**On Site:** The subject site is predominately cleared with clusters of trees located on the eastern portion of the site. **Off Site-** General surrounds are predominately undeveloped land to the north, residential development to the south, east and west. It appears that minor agricultural activates are also present in the west and south. An access track is located to the west of the site which leads to building structure to north of the site.
1966	Department of Lands Scale: - B/W	**On Site-** The site appears to have undergone land clearing / land disturbance (due to image quality difficult to determine). **Off Site-** Increase in residential development to the east and west. It appears that poultry sheds have been constructed north-west of the site. It appears that another structure has been erected to the north of dwelling, north of the subject site.
1975	Department of Lands Scale: - B/W	**On Site-** Generally consistent with the 1966 photograph, but with no further evidence of land clearing / disturbance. Minor increase in tree growth to the east. **Off Site-** Generally consistent with the 1966 photograph, with a minor increase in residential development.
2006	Department of Lands Colour	**On Site-** Generally consistent with the 1975 photograph but with an increase in tree density to the north and east. **Off Site-** Generally consistent with the 1975 photograph, with an increase in residential development to the east and west of the site. Several structures have been constructed within proximity of the existing residential dwelling, north of the subject site
17/02/2013	Google Earth Aerial Image	**On Site-** Generally consistent with the 2006 aerial photograph. **Off Site-** Generally consistent with the 2006 photograph, with an increase in residential development to the east, south and west. It is also observed that the poultry sheds to the north-west of the site have been removed. It is noted that several motor vehicles are present behind the existing residential dwelling, north of the subject site

3.2 Office of Environment & Heritage (EPH) Notices

A search of Department of Environment & Climate Change (DECC) records revealed no notices have been issued for the site under the Contaminated Land Management Act (1997). Under Section 308 of the Protection of the Environment Operations Act (POEO) a public register is required to list licenses, applications, or notices issued by the DECC. A search of the public register for the site did not reveal any licenses, applications, or notices.

3.3 Lake Macquarie City Council (LMCC) Records (S149 Certificates)

A review of the section 149 certificates obtained from Lake Macquarie City Council indicates;

> The site does not contain critical habitat;

> The land is not in a Heritage Conservation Area;

> An item of environmental heritage, namely Aboriginal heritage may affect the land;

> The land is not affected by coastal protection;

> General Housing, Housing Alterations, General Commercial & Industrial, Subdivisions, Rural Housing, General Development and Demolition codes may be carried out on the land.

> The overall site is not proclaimed to be within a Mine Subsidence District;

> The land is not affected by any road widening or re-alignment;

> The site is affected by land slip or subsidence;

> The land is not affected by tidal inundation

> The site has the potential to contain acid sulfate soils;

> The land is not mapped as “bushfire prone land”;

> The site is subjected to flood related development controls;

> Contaminated or potentially contaminated land;

> The land is not subjected to Bio-banking agreements;

> The land is not subject to a property vegetation plan under the Native Vegetation Act 2003;

> The land is not affected by an Order Under Trees (disputes between neighbours) ACT 2006; and

> Council is not aware of any site capability certificate for any proposed development on the land.

3.4 Title Deeds

Services First Registration Pty Ltd was engaged by CGS to undertake a title deed search of the lots which make up the site over a nominal 100 year period.

The search results are contained in Appendix B and are broadly summarised as detailed in the table below.

Table 3-2 Title Deed Search

Date of Acquisition and term held	Registered Proprietor(s) & Occupations where available	Reference to Title at Acquisition and sale
05.06.1903 (1903 to 1910)	Alfred Davis (Farmer)	Vol 1472 Fol 21
06.04.1910 (1910 to 1910)	Anastasia Davis (Widow) (Transmission Application not investigated)	Vol 1472 Fol 21
26.07.1910 (1910 to 1918)	Hannah Henderson (Married Woman)	Vol 1472 Fol 21
14.08.1918 (1918 to 1960)	Christie Gruber Thomson (Builder)	Vol 1472 Fol 21
09.09.1960 (1960 to 1960)	Alice Susan Thomson (Widow) (Section 94 Application not investigated)	Vol 1472 Fol 21
09.05.1960 (1960 to 2014)	Henry Daniel Millard Thomson (Salesman)	Vol 1472 Fol 21 Now 12/1158508
25.07.2013 (2013 to 2014)	Barbara Joan Watson Peter Edmund Watson (Executors of the Will of Henry Daniel Millard Thomson)	12/1158508

09.07.2014 (2014 to date)	# Australasian Conference Association Limited	12/1158508

Notes to Table:
# Denotes Current Registered Proprietors
Leases and Easements: Nil

4 Investigation Methodology and Findings

4.1 Fieldwork

The fieldwork component for the PCA by CGS was undertaken by a Principal Technical Officer to identify potential Areas of Environment Concern (AEC) and subsequent fieldwork by a CGS senior laboratory technician on 31 July 2014 which comprised the following:

> Excavation of three (3) test pits (TP001-TP003) using a 5 tonne excavator fitted with a 300mm bucket. The test pits were advanced to depths of 1.20 – 1.50m.

> Collection of bulk and disturbed samples for subsequent environmental testing.

All field work was carried out by and in the presence of CGS personnel. Environmental samples were located by reference to site features and should be considered as approximate with sampling locations shown on Drawing CGS2276-003-d1, attached in Appendix A.

4.2 Sampling and Contamination Procedures

Environmental sampling was performed according to CGS standard operating procedures with sampling data recorded on Chain of Custody sheets, and the general sampling procedure comprising:

> The use and changing of disposable gloves between each sampling event to prevent cross contamination;

> Decontamination of all sampling equipment using a 3% solution of phosphate free detergent (Decon 90) and tap water prior to each pit;

> Soil sample storage for all sampling events was via appropriate containers supplied by ALS laboratories;

> Samples storage in a chilled insulated containers prior to transport to the laboratory; and

> Sample storage less than 72hrs.

4.3 Environmental Laboratory Assessment

The environmental / contamination assessment comprised the collection of four (4) soil samples. The initial sampling was targeted based on observed site conditions. The analytes selected for testing were typical of a standard contamination assessment and comprised of chemical analysis of;

> Total Petroleum Hydrocarbons (TPH),

> Polycyclic Aromatic Hydrocarbons (PAH),

> Organophosphorus Pesticides (OPP),

> Polychlorinated Biphenyls (PCBs),

> Organochlorine Pesticides (OCP),

> 8 heavy metals and BTEX, and

> Presence of Asbestos

Chemical laboratory testing was carried out on soil samples using ALS Laboratories, which holds current accreditation with the National Association of Testing Authorities, Australia (NATA).

4.4 Published Data

4.4.1 Regional Geology

Reference to the Newcastle Coalfield Regional Geology map, Geological Series Sheet 9231 Edition 1 1995 indicates that the site is situated within the Narrabeen Group which is known to comprise of Early Triassic Age deposits of sandstone, siltstone, conglomerate, claystone and soils derived from these rock types.

4.4.2 Acid Sulphate Soil Risk Maps

Reference to the Department of Environment and Climate Change Acid Sulphate Risk Map for Morisset dated 1997, indicates that predominately the site is situated within no known occurrence of acid sulphate soils. The most southern portion of the site is on the boundary where depth to acid sulphate materials are 3m below ground surface level.

4.5 Subsurface Conditions

The subsurface conditions encountered in test pits/bores across the site are detailed on the report log sheets, and attached in Appendix C together with explanatory notes. The subsurface generally comprised of Silty SAND topsoil materials overlying residual Clayey SAND / Sandy CLAY.

The clays were assessed to be slightly over of Optimum Moisture Content (OMC) at the time of fieldwork, and based on DCP blow counts, ranged from stiff to very stiff in consistency.

No groundwater or seepage was encountered in the test pits at the time of fieldwork. It should be noted that groundwater levels are likely to fluctuate with variations in climatic and site conditions.

5 Criteria for Contamination Assessment

5.1 General

It should be appreciated that the assessment was preliminary in nature and was very limited in scope.

5.1.1 NEPM – NATIONAL ENVIRONMENT PROTECTION (ASSESSMENT OF SITE CONTAMINATION) MEASURE (2013)

The current assessment criteria used in NSW to evaluate soil analytical results are based on the NSW DEC Guidelines for the NSW Site Auditor Scheme 2nd Edition 2006 [1] and National Environment Protection Measure (NEPM) for the Assessment of Site Contamination, 2013 [2], and was used as the criteria for the assessment of the soil on site. Table 5A of Schedule B (1) Guideline on Investigation Levels for Soil and Groundwater provides limits on investigation concentrations for contaminants based on human health risk and certain exposure scenarios due to site use.

The proposed site use is commercial / industrial and therefore the following guidelines have been adopted:

> Health Investigation Levels (HIL's) D "Commercial / Industrial" - includes premises such as offices, factories and industrial sites.

5.1.2 NSW EPA- Service Station Criteria

> The assessment criteria adopted for TPH C6-C36, and BTEX were the "Guidelines for Assessing Service Station Sites" produced by the NSWEPA, December 1994, [3]. These guidelines provide assessment criteria for soil and water on service station sites and are applicable for sites where fuel oil / grease have been utilised.

5.2 Areas of Concern

The desktop review and site inspection has identified possible contamination associated with:

> Potential herbicide and pesticide used on site;

> Potential contamination associated with isolated dumping of household items, building rubble such as bricks and tiles;

> Previous structures;

> Effluent disposal (located north of subject site); and

> Potential onsite filling.

In order to provide preliminary comment on the identified AEC's a limited program of targeted intrusive testing was undertaken.

The fieldwork was based on observed conditions and comprised surface sampling at targeted locations. Sample locations are shown on Drawing CGS2276-003-d1 attached in Appendix A.

6 Laboratory Testing

Laboratory testing was carried out on soil samples using ALS Laboratories, which holds current accreditation with the National Association of Testing Authorities, Australia (NATA).

All testing was undertaken within the terms of their accreditation. Copies of the testing laboratory reports are shown in Appendix D. The results of laboratory analysis for inorganic and organic contaminants in the soil samples are summarised in the following tables:

Table 6-1 – Results of Laboratory Analysis for Heavy Metals;

Table 6-2 – Results of Laboratory Analysis for TPH/BTEX;

Table 6-3 – Results of Laboratory Analysis for Polycyclic Aromatic Hydrocarbons (PAHs);

Table 6-4 – Organochlorine & Organophosphorus Pesticides (OCP/OPP's);

Table 6-5 – Polychlorinated Biphenyls (PCB); and

Table 6-6 – Results of Asbestos testing of Soils.

Laboratory shrink swell test results are summarised in Table 6-7 and report sheets attached in appendix C of this report

Table 6-1 Results of Laboratory Analysis for Heavy Metals for soils (Results in mg/kg)

Sample ID	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn
ES001	<5	<1	5	<5	5	<0.1	<2	10
ES002	<5	<1	11	<5	7	<0.1	<2	<5
ES003	<5	<1	8	9	28	<0.1	<2	133
QA1 / ES001	<5	<1	5	<5	5	<0.1	<2	10
LOR(1)	5	1	2	5	5	0.1	2	5
Guideline(2)	3,000	900	3,600	240,000	1,500	730	6,000	400,000

Notes to Table:
1. LOR- Limiting of Reporting
2. National Environment Protection Measure (NEPM) for the Assessment of Site Contamination, 2013 [2] Health Based Investigation Levels, "Commercial / Industrial D"
3. **Bold** indicates exceedance of Guideline

Table 6-2 Results of Laboratory Analysis for TPH/BTEX (Results in mg/kg)

Sample ID	Total Recoverable Hydrocarbons (TPH)				Monocyclic Aromatic Hydrocarbons (BTEX)			
	C6-C9	C10-C14	C15-C28	C29-C36	Benzene	Toluene	Ethyl Benzene	Total Xylene
ES001	<10	<50	<100	<100	<0.2	<0.5	<0.5	<0.5
ES002	<10	<50	<100	<100	<0.2	<0.5	<0.5	<0.5
ES003	<10	<50	<100	<100	<0.2	<0.5	<0.5	<0.5
QA1 / ES001	<10	<50	<100	<100	<0.2	<0.5	<0.5	<0.5
LOR(1)	10	50	100	100	0.2	0.5	0.5	0.5
Guideline(2)	65	1000			1	1.4	3.1	14

Notes to Table:
1 LOR- Limiting of Reporting
2 NSW EPA Contaminated Sites Guidelines for Assessing Service Station Sites (1994) [3]
3 **Bold** indicates exceedance of Guideline

Table 6-3 Results of Laboratory Analysis for PAHs

	LOR	Guidelines	Sample ID			
Sample Id			ES001	ES002	ES003	QA1 / ES001
Naphthalene	0.5	See Note(2)	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	0.5	See Note(2)	<0.5	<0.5	<0.5	<0.5
Acenaphthene	0.5	See Note(2)	<0.5	<0.5	<0.5	<0.5
Fluorene	0.5	See Note(2)	<0.5	<0.5	<0.5	<0.5
Phenanthrene	0.5	See Note(2)	<0.5	<0.5	2.5	<0.5
Anthracene	0.5	See Note(2)	<0.5	<0.5	<0.5	<0.5
Fluoranthene	0.5	See Note(2)	<0.5	<0.5	0.7	<0.5
Pyrene	0.5	See Note(2)	<0.5	<0.5	0.6	<0.5
Benzo(a)anthracene	0.5	See Note(2)	<0.5	<0.5	<0.5	<0.5
Chrysene	0.5	See Note(2)	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	0.5	See Note(2)	<0.5	<0.5	<0.5	<0.5
Benzo(k)Fluroanthene	0.5	See Note(2)	<0.5	<0.5	<0.5	<0.5
Benzo (a) pyrene	0.5	1	<0.5	<0.5	<0.5	<0.5
Indeno(1,2,3-c,d)pyrene	0.5	See Note(2)	<0.5	<0.5	<0.5	<0.5
Dibenzo(a,h)anthracene	0.5	See Note(2)	<0.5	<0.5	<0.5	<0.5
Benzo(g,h,i)perylene	0.5	See Note(2)	<0.5	<0.5	<0.5	<0.5
Sum of PAH	0.5	See Note(2)	<0.5	<0.5	<0.5	<0.5

Notes to Table 6:
1 LOR- Limiting of Reporting
2 National Environment Protection Measure (NEPM) for the Assessment of Site Contamination, 2013 [2] Health Based Investigation Levels, 'Commercial / Industrial D'
3 Bold indicates exceedance of Guideline 1

Table 6-4 Results of Laboratory Analysis for OCP/OPP

	LOR	Guidelines	Sample ID			
Sample Id			ES001	ES002	ES003	QA1 / ES001
HCB	0.05	80	<0.05	<0.05	<0.05	<0.05
alpha-BHC	0.05	See Note(2)	<0.05	<0.05	<0.05	<0.05
gamma-BHC	0.05	See Note(2)	<0.05	<0.05	<0.05	<0.05
beta-BHC	0.05	See Note(2)	<0.05	<0.05	<0.05	<0.05
Heptachlor	0.05	10	<0.05	<0.05	<0.05	<0.05
delta-BHC	0.05	See Note(2)	<0.05	<0.05	<0.05	<0.05
Aldrin	0.05	45	<0.05	<0.05	<0.05	<0.05
Heptachlor Epoxide	0.05	See Note(2)	<0.05	<0.05	<0.05	<0.05
Endosulfan	0.05	See Note(2)	<0.05	<0.05	<0.05	<0.05
DDE	0.05	See Note(2)	<0.05	<0.05	<0.05	<0.05
Dieldrin	0.05	See Note(2)	<0.05	<0.05	<0.05	<0.05
Endrin	0.05	See Note(2)	<0.05	<0.05	<0.05	<0.05
DDD	0.05	See Note(2)	<0.05	<0.05	<0.05	<0.05
Endosulfan	0.05	See Note(2)	<0.05	<0.05	<0.05	<0.05
DDT	0.05	See Note(2)	<0.05	<0.05	<0.05	<0.05
Endrin Aldehyde	0.05	See Note(2)	<0.05	<0.05	<0.05	<0.05
Endosulfan Sulphate	0.05	2,000	<0.05	<0.05	<0.05	<0.05
Methoxychlor	0.05	2,500	<0.05	<0.05	<0.05	<0.05
Chlorpyrifos	0.5	See Note(2)	<0.05	<0.05	<0.05	<0.05
Demeton	0.05	See Note(2)	<0.05	<0.05	<0.05	<0.05
Diazinon	0.05	See Note(2)	<0.05	<0.05	<0.05	<0.05
Dichlorvos	0.05	See Note(2)	<0.05	<0.05	<0.05	<0.05
Dimethoate	0.05	See Note(2)	<0.05	<0.05	<0.05	<0.05

Notes to Table
1 LOR- Limiting of Reporting
2 National Environment Protection Measure (NEPM) for the Assessment of Site Contamination, 2013 [2] Health Based Investigation Levels, Column D Commercial / Industrial. Some of the thresholds are for combination of pesticides and some pesticides do not have current threshold concentrations.
3 Bold indicates exceedance of Guideline

Table 6-5 Results of Laboratory Analysis for Polychlorinated Biphenyls (PCB)

TP/No.	LOR	Guidelines	Sample ID			
Sample Id			ES001	ES002	ES003	ES001 / QA1
Total PCB	0.1	7	<0.1	<0.1	<0.1	<0.1

Notes to Table
1 LOR- Limiting of Reporting
2 National Environment Protection Measure (NEPM) for the Assessment of Site Contamination, 2013 [2] Health Based Investigation Levels, "Commercial / Industrial D"
3 Bold indicates exceedance of Guideline 1

Table 6-6 Results of Laboratory Analysis for Asbestos in Soil

Sample ID	Comment
ES001	Not Detected
ES002	Not Detected
ES003	Not Detected
QA1 / ES001	Not Detected

7 Comments and Discussions

7.1 Analysis of Contamination Results

7.1.1 Heavy Metals

Appraisal of the results indicated that the levels of metals within the samples tested were below the threshold limits as detailed in National Environment Protection Measure (NEPM) for the Assessment of Site Contamination, 2013 [2] “Commercial / Industrial D”.

7.1.2 Total Petroleum Hydrocarbon (TPH)

Appraisal of the results indicated PAH’s were below the threshold limits as detailed in the National Environment Protection Measure for the Assessment of Site Contamination, 2013 [2] “Commercial / Industrial D”.

7.1.3 Polycyclic Aromatic Hydrocarbon (PAH)

Appraisal of the results indicated PAH’s were below the threshold limits as detailed in the National Environment Protection Measure for the Assessment of Site Contamination, 2013 [2] “Commercial / Industrial D”.

7.1.4 Organophosporous & Organochlorine Pesticides (OPP/OCP) & Polychlorinated Biphenyls (PCB)

Appraisal of the results indicated that the levels of OPP, OCP and PCB within the samples tested were below the threshold limits as detailed in National Environment Protection Measure for the Assessment of Site Contamination, 2013 [2] “Commercial / Industrial D”.

7.1.5 Asbestos Material

Soil samples were collected and analysed for presence of asbestos at ALS Laboratories. The results reveal that asbestos was not detected in any of the samples.

8 Conclusions

The PCA was undertaken to determine the current site status in relation to potential contamination to support the proposed water recycling facility development. The purpose of the investigation was to provide comment on the potential contamination status of the site as part of a separate rezoning and development applications to Lake Macquarie City Council (LMCC) and to demonstrate whether the site is suitable for development from a contamination standpoint

The desktop review and site inspection has identified possible contamination associated with:

> Potential herbicide and pesticide used on site;

> Potential contamination associated with isolated dumping of household items, building rubble such as bricks and tiles in proximity to the western boundary of the site ;

> Previous structures;

> Onsite effluent disposal; and

> Potential onsite filling.

A limited intrusive sampling and testing regime was undertaken to provide a preliminary assessment of the identified AEC's.

Based on the findings of the PCA and comparison of the analytical testing undertaken to threshold limits detailed in National Environment Protection Measure (NEPM) for the Assessment of Site Contamination, 1999 [2] "Commercial / Industrial D", no indication of gross contamination has been identified on the site

It is considered that the site would be suitable for rezoning and development from a contamination perspective subject to any geotechnical constraints associated proposed development.

It must be noted that the assessment was limited to the proposed footprint of the facility located within the central western portion of the site as shown on the attached drawing CGS2276-003-d1 and excludes the surrounding area. Only minor anthropogenic materials such timbers plastic bottles and other domestic items where noted within the subject site during inspection.

9 Limitations

Cardno Geotech Solutions (CGS) have performed investigation and consulting services for this project in general accordance with current professional and industry standards. The extent of testing was limited to discrete test locations and variations in ground conditions can occur between test locations that cannot be inferred or predicted.

A geotechnical consultant or qualified engineer should provide inspections during construction to confirm assumed conditions in this assessment. If subsurface conditions encountered during construction differ from those given in this report, further advice should be sought without delay.

Cardno Geotech Solutions, or any other reputable consultant, cannot provide unqualified warranties nor does it assume any liability for the site conditions not observed or accessible during the investigations. Site conditions may also change subsequent to the investigations and assessment due to ongoing use.

This report and associated documentation was undertaken for the specific purpose described in the report and should not be relied on for other purposes. This report was prepared solely for the use by Johnson Property Group and any reliance assumed by other parties on this report shall be at such parties own risk.

10 References

[1] NSW DEC, Guidelines for the NSW Site Auditor Scheme 2nd Edition 2006

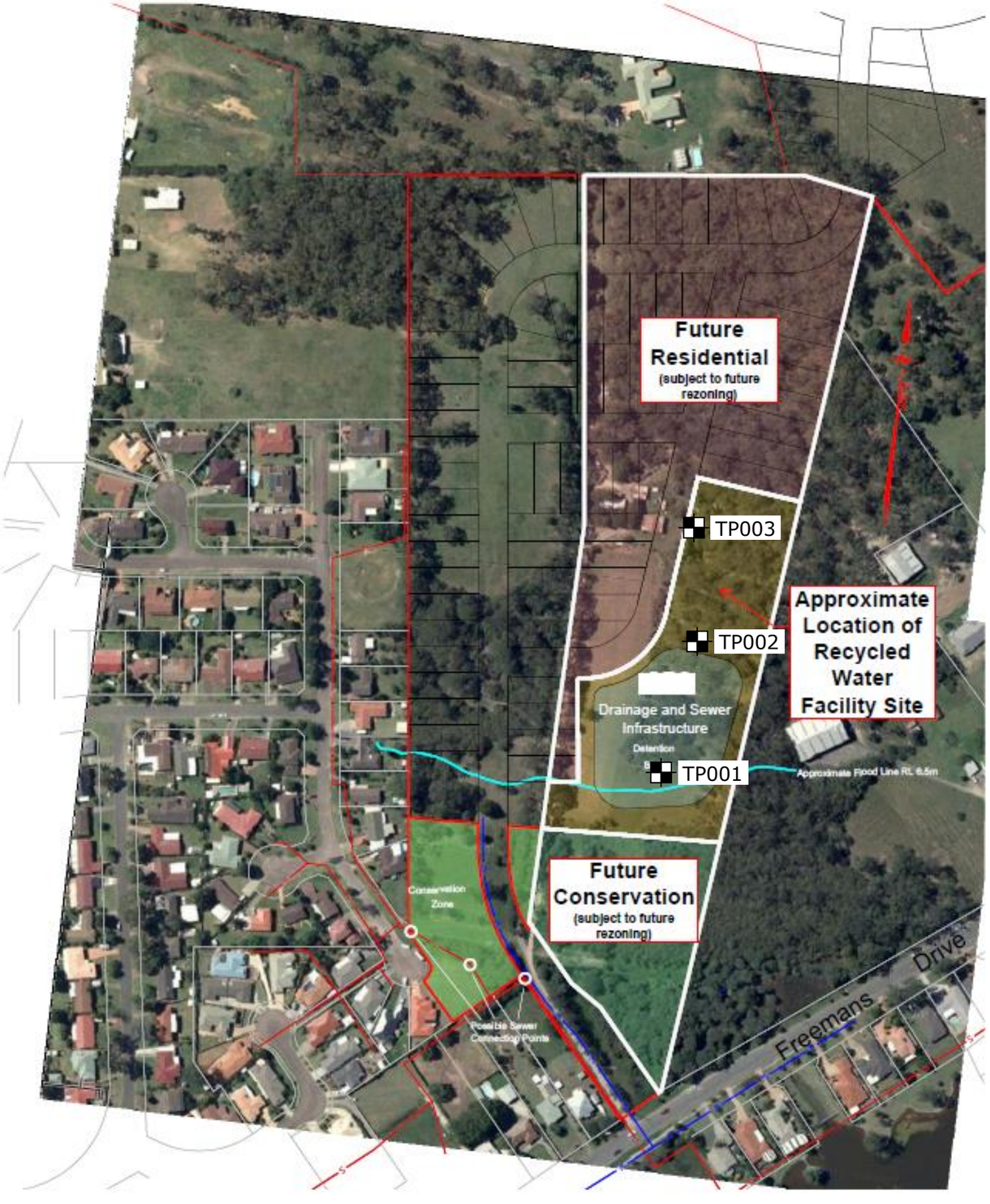
[2] NEPC**,** National Environment Protection (Assessment of Site Contamination) Measure, 1999 (compilation date 16 May 2013)

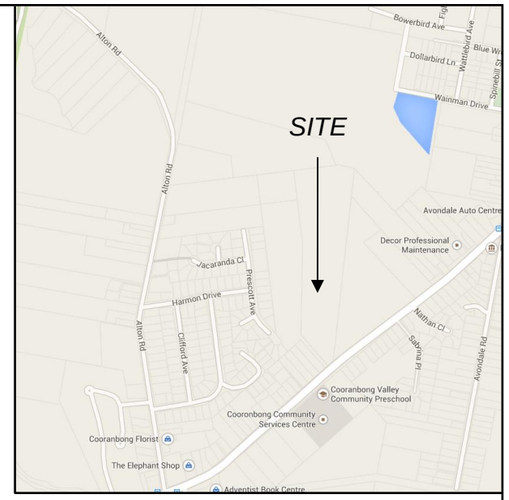
[3] NSWEPA**,** Guidelines for Assessing Service Station Sites, December 1994

APPENDIX A
DRAWINGS AND AERIAL PHOTOGRAPHS

Cardno Geotech Solutions
Shaping the Future

N





NOTES:

Drawing adapted from Johnson Property Group "Construction and operation of an onsite sewerage system with a capacity greater than 2,500 persons", 617 Freemans Drive, Cooranbong (Lot 12, DP1158508).

Drawing is not to scale

LEGEND:

Approximate test pit locations and numbers

Cardno Geotech Solutions
Shaping the Future

DRAWING TITLE:	TEST PIT LOCATION PLAN
PROJECT NAME:	PRELIMINARY CONTAMINATION ASSESSMENT
SITE LOCATION:	617 FREEMANS DRIVE, COORANBONG

CLIENT:	Johnson Property Group Pty Ltd
PROJECT NO:	CGS2276
DRAWING NO:	1
FILE REF:	CGS2276-003-d1r1

DRAWN BY: DS CHECKED BY: IGP
OFFICE: 4/5 Arunga Drive, Beresfield NSW 2322
DATE: 7 August 2014

1954

1966

1975

2006

APPENDIX B
149 CERTIFICATES AND TITLE DEEDS

Cardno Geotech Solutions
Shaping the Future

Lake Macquarie City Council

Lake Macquarie City Council

22 July 2013

DEREK DAVELAAR
DX 7834
NEWCASTLE

Our Ref:79787
Your Ref:
ABN 81 065 027 868

SECTION 149 PLANNING CERTIFICATE

ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979

Fee Paid:	53.00
Receipt No:	7436923
Receipt Date:	19 July 2013

DESCRIPTION OF LAND

Address:	617 Freemans Drive, COORANBONG NSW 2265
Lot Details:	Lot 12 DP 1158508
Parish:	Coorumbung
County:	Northumberland

For: BRIAN BELL
GENERAL MANAGER

J Hayes

126-138 Main Road Speers Point NSW 2284 ● Box 1906 Hunter Region Mail Centre NSW 2310
Phone: 02 4921 0333 ● Fax: 02 4958 7257 ● ABN 81 065 027 868
council@lakemac.nsw.gov.au
www.lakemac.com.au

ADVICE PROVIDED IN ACCORDANCE WITH SECTION 149(2)

1 Names of Relevant Planning Instruments and Development Control Plans

(1) The name of each environmental planning instrument that applies to the carrying out of development on the land.

Lake Macquarie Local Environmental Plan 2004

State Environmental Planning Policy No. 1 – Development Standards

State Environmental Planning Policy No. 4 – Development without Consent and Miscellaneous Exempt and Complying Development (except Clause 6-10)

State Environmental Planning Policy No. 6 – Number of Storeys in a Building

State Environmental Planning Policy No. 15 – Rural Landsharing Communities

State Environmental Planning Policy No. 19 – Bushland in Urban Areas

State Environmental Planning Policy No. 21 – Caravan Parks

State Environmental Planning Policy No. 33 – Hazardous and Offensive Development

State Environmental Planning Policy No. 36 – Manufactured Homes Estates (except as maybe excluded by Clause 6 of the SEPP)

State Environmental Planning Policy No. 44 – Koala Habitat Protection

State Environmental Planning Policy No. 50 – Canal Estate Development

State Environmental Planning Policy No. 55 – Remediation of Land

State Environmental Planning Policy No. 62 - Sustainable Aquaculture

State Environmental Planning Policy No. 64 – Advertising and Signage

State Environmental Planning Policy (Affordable Rental Housing) 2009

State Environmental Planning Policy (Building Sustainability Index: BASIX) 2004

State Environmental Planning Policy (Exempt and Complying Development Codes) 2008

State Environmental Planning Policy (Infrastructure) 2007

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

State Environmental Planning Policy - (Housing for Seniors or People with a Disability) 2004 (This SEPP applies to the land to the extent provided by Clause 4 of the SEPP)

State Environmental Planning Policy (Major Development) 2005

State Environmental Planning Policy (Temporary Structures) 2007

(2) The name of each proposed environmental planning instrument that will apply to the carrying out of development on the land and that is or has been the subject of community consultation or on public exhibition under the Act (unless the Director-General has notified the council that the making of the proposed instrument has been deferred indefinitely or has not been approved).

Draft Lake Macquarie Local Environmental Plan 2013

(3) The name of each development control plan that applies to the carrying out of development on the land.

Development Control Plan No. 1 – Principles of Development

Development Control Plan No. 2 – Complying Development

(4) In this clause, proposed environmental planning instrument includes a planning proposal for a Local Environmental Plan or a Draft environmental planning instrument.

2 Zoning and land use under relevant Local Environmental Plans

(1) The following answers (a) to (h) relate to the instrument (see 1(1) above).

(a) (i) The identity of the zone applying to the land.

10 Investigation Zone
under Lake Macquarie Local Environmental Plan 2004

(ii) The purposes for which the Instrument provides that development may be carried out within the zone without the need for development consent.

Exempt development as provided in Schedule 1

(iii) The purposes for which the Instrument provides that development may not be carried out within the zone except with development consent.

agriculture (other than intensive agriculture); bed and breakfast accommodation; drainage; dwelling houses; earthworks; emergency services facilities; environmental facilities; home businesses; home industries; roads; roadside stalls; signs; stormwater management facilities; telecommunications facilities; utility installations

(iv) The purposes for which the Instrument provides that development is prohibited within the zone.

Any development not specified in item (ii) or (iii)

NOTE: **The advice in sections (a) above relates only to restrictions that apply by virtue of the zones indicated. The Lake Macquarie LEP 2004 includes additional provisions that require development consent for particular types of development, or in particular circumstances, irrespective of zoning.**

(b) Whether any development standards applying to the land fix minimum land dimensions for the erection of a dwelling-house on the land and, if so, the minimum land dimensions so fixed.

Specified in Attachment B - Schedule 2.

(c) Whether the land includes or comprises critical habitat.

No

(d) Whether the land is in a conservation area (however described).

No

(e) Whether an item of environmental heritage (however described) is situated on the land.

See Attachment C - Schedules 4, 5 and 6

An item of environmental heritage, namely Aboriginal heritage, listed within the Aboriginal Heritage Information Management System, may affect the land. The applicant should contact the NSW Office of Environment and Heritage (OEH) for more information.

(2) The following answers relate to the Draft Instrument (see 1(2) above).

(a) (i) The identity of the zone applying to the land.

RU6 Transition

under Draft Lake Macquarie Local Environmental Plan 2013

(ii) The purposes for which the Draft Instrument provides that development may be carried out within the zone without the need for development consent.

Exempt development as provided in Schedule 2

(iii) The purposes for which the Draft Instrument provides that development may not be carried out within the zone except with development consent.

Bed and breakfast accommodation; Drainage; Dwelling houses; Earthworks; Emergency services facilities; Environmental facilities; Extensive agriculture; Filming; Home businesses; Home industries; Roads; Roadside stalls; Signage; Telecommunications facilities.

(iv) The purposes for which the Draft Instrument provides that development is prohibited within the zone.

Any other development not specified in item (ii) or (iii)

NOTE: The advice in section (a) above relates only to restrictions that apply by virtue of the zones indicated. The Draft instrument may include additional provisions that require development consent for particular types of development, or in particular circumstances, irrespective of zoning.

(b) Whether any development standards applying to the land fix minimum land dimensions for the erection of a dwelling-house on the land and, if so, the minimum land dimensions so fixed.

Yes, there are development standards applying to the land that fix minimum land dimensions for the erection of a dwelling house.

Minimum lot size of 200 ha. Refer to Clause 7.10 of draft LMLEP 2013 for further information.

(c) Whether the land includes or comprises critical habitat.

No

(d) Whether the land is in a conservation area (however described).

No

(e) Whether an item of environmental heritage (however described) is situated on the land.

No

3 Complying development

Whether or not the land is land on which complying development may be carried out under each of the codes for complying development because of the provisions of clauses 1.17A(c) and (d) and 1.19 of *State Environmental Planning Policy (Exempt and Complying Development Codes) 2008.*

General Housing Code

Complying development under the General Housing Code MAY be carried out on the land.

Housing Alterations Code

Complying development under the Housing Internal Alterations Code MAY be carried out on the land.

General Commercial and Industrial Code

Complying development under the General Commercial and Industrial Code MAY be carried out on the land.

Subdivisions Code

Complying development under the Subdivisions Code MAY be carried out on the land.

Rural Housing Code

Complying development under the Rural Housing Code MAY be carried out on the land.

General Development Code

Complying development under the General Development Code MAY be carried out on the land.

Demolition Code

Complying development under the Demolition Code MAY be carried out on the land.

4 Coastal Protection

Whether or not the land is affected by the operation of section 38 or 39 of the Coastal Protection Act 1979, but only to the extent that the Council has been so notified by the Department of Public Works.

No

4A Information relating to beaches and coasts

1 Whether an order has been made under Part 4D of the Coastal Protection Act 1979 in relation to temporary coastal protection works (within the meaning of that Act) on the land (or on public land adjacent to that land), except where the council is satisfied that such an order has been fully complied with.

Nil

2 (a) Whether the council has been notified under section 55X of the Coastal Protection Act 1979 that temporary coastal protection works (within the meaning of that Act) have been placed on the land (or on public land adjacent to that land)

Nil

(b) If works have been so placed — whether the council is satisfied that the works have been removed and the land restored in accordance with that Act.

Nil

4B Annual charges under Local Government Act 1993 for coastal protection services that relate to existing coastal protection works

Whether the owner (or any previous owner) of the land has consented in writing to the land being subject to annual charges under section 496B of the Local Government Act 1993 for coastal protection services that relate to existing coastal protection works (within the meaning of section 553B of that Act).

Nil

NOTE: "Existing coastal protection works" are works to reduce the impact of coastal hazards on land (such as seawalls, revetments, groynes and beach nourishment) that existed before the commencement of section 553B of the Local Government Act 1993.

5 Mine subsidence

Whether or not the land is proclaimed to be a mine subsidence district within the meaning of section 15 of the Mine Subsidence Compensation Act 1961.

No

6 Road widening and road realignment

Whether the land is affected by any road widening or realignment under:

(a) Division 2 of Part 3 of the Roads Act 1993.

No

(b) any environmental planning instrument.

No

(c) any resolution of the Council.

No, other road widening proposals may affect this land and if so, will be noted on the SECTION 149(5) certificate.

7 Council and other public authority policies on hazard risk restrictions

Whether or not the land is affected by a policy:

(i) adopted by the Council, or

(ii) adopted by any other public authority and notified to the Council for the express purpose of its adoption by that authority being referred to in planning certificates issued by the Council,

that restricts the development of the land because of the likelihood of:

(a) land slip or subsidence

Yes

All land within the Lake Macquarie City Council area is divided into geotechnical zones, and section 2.1.9 Sloping Land and Soils, in DCP No.1, applies when development of land is proposed. If you require any further clarification on the policy and how it may affect any possible development applications contact the Council on 02 4921 0333.

(b) bushfire

No

(c) tidal inundation

No

(d) acid sulfate soils

Yes if indicated on the Acid Sulfate Soils Planning Maps supplied by The Department of Land & Water Conservation marked Edition 2, dated December 1997, available at the Council.

(e) any other risk (other than flooding).

Contaminated or potentially contaminated land

Section 2.1.13 Contaminated Land of Lake Macquarie DCP No. 1 applies to this land.

NOTE: **The absence of a council policy restricting development of the land by reason of a particular natural hazard does not mean that the risk from that hazard is non-existent.**

7A Flood related development controls information

(1) Whether or not development on that land or part of the land for the purposes of dwelling houses, dual occupancies, multi dwelling housing or residential flat buildings (not including development for the purposes of group homes or seniors housing) is subject to flood related development controls.

Yes

(2) Whether or not development on that land or part of the land for any other purpose is subject to flood related development controls.

Yes

(3) Words and expressions in this clause have the same meanings as in the instrument set out in the Schedule to the *Standard Instrument (Local Environmental Plans) Order 2006*.

ADVICE: Further information on the development restriction mentioned, may be obtained from Council upon application for a "Flood Certificate" or "Flood/Tidal Inundation Certificate".

8 Land reserved for acquisition

Whether or not any environmental planning instrument or proposed environmental planning instrument referred to in Clause 1 makes provision in relation to the acquisition of the land by a public authority, as referred to in section 27 of the Act.

No

9 Contributions Plans

The name of each contributions plan applying to the land.

Lake Macquarie City Council Development Contributions Plan 2012 - Morisset Contributions Catchment

10 Biobanking Agreements

This land is not subject to a Biobanking agreement entered under Part 7A of the Threatened Species Conservation Act 1995.

11 Bush Fire Prone Land

NONE of the land is bush fire prone land.

NOTE: The Lake Macquarie Bush Fire Prone Land Map can be inspected at Council's Administration Building during normal office hours or contact Council on 02 4921 0333.

12 Property Vegetation Plans

The land IS NOT subject to a property vegetation plan under the Native Vegetation Act 2003.
NOTE: The advice provided in this section is based on notification by the Hunter Central Rivers Catchment Management Authority of the approval of a plan. Further information about property vegetation plans should be obtained from that Authority.

13 Orders under Trees (Disputes Between Neighbours) Act 2006

Has an order been made under the Trees (Disputes Between Neighbours) Act 2006 to carry out work in relation to a tree on the land (but only if the council has been notified of the order).

The land IS NOT subject to an order made under the Trees (Disputes Between Neighbours) Act 2006 to carry out work in relation to a tree on the land.

14 Directions under Part 3A

If there is a direction by the Minister in force under section 75P (2) (c1) of the Act that a provision of an environmental planning instrument prohibiting or restricting the carrying out of a project or a stage of a project on the land under Part 4 of the Act does not have effect, a statement to that effect identifying the provision that does not have effect.

Nil

15 Site compatibility certificates and conditions for seniors housing

(a) Whether there is a current site compatibility certificate (seniors housing), of which the council is aware, in respect of proposed development on the land.

Council is not aware of any site capability certificate for any proposed development on the land.

(b) Any terms of a kind referred to in clause 18 (2) of State Environmental Planning Policy (Housing for Seniors or People with a Disability) 2004 that have been imposed as a condition of consent to a development application granted after 11 October 2007 in respect of the land.

Nil

16 Site compatibility certificates for infrastructure

Whether there is a valid site compatibility certificate (infrastructure), of which the council is aware, in respect of proposed development on the land.

Council is not aware of any site capability certificate for any proposed development on the land.

17 Site compatibility certificates and conditions for affordable rental housing

(1) Whether there is a current site compatibility certificate (affordable rental housing), of which the council is aware, in respect of proposed development on the land.

Council is not aware of any site capability certificate for any proposed development on the land.

(2) Any terms of a kind referred to in clause 17 (1) or 38 (1) of *State Environmental Planning Policy (Affordable Rental Housing) 2009* that have been imposed as a condition of consent to a development application in respect of the land.

Nil

18 Paper subdivision information

(1) The name of any development plan adopted by a relevant authority that applies to the land or that is proposed to be subject to a consent ballot.

Nil

(2) The date of any subdivision order that applies to the land.

Not Applicable

Note Words and expressions used in this clause have the same meaning as they have in Part 16C of Environmental Planning and Assessment Regulation 2000.

NOTE: The following matters are prescribed by section 59 (2) of the Contaminated Land Management Act 1997 as additional matters to be specified in a planning certificate:

Matters arising under the Contaminated Land Management Act 1997 (s59 (2))

(a) The land to which the certificate relates is significantly contaminated land within the meaning of that Act - if the land (or part of the land) is significantly contaminated land at the date when the certificate is issued,

No

(b) The land to which the certificate relates is subject to a management order within the meaning of that Act – if it is subject to such an order at the date when the certificate is issued,

No

(c) The land to which the certificate relates is the subject of an approved voluntary management proposal within the meaning of that Act - if it is the subject of such an approved proposal at the date when the certificate is issued,

No

(d) The land to which the certificate relates is subject to an ongoing maintenance order within the meaning of that Act - if it is subject to such an order at the date when the certificate is issued,

No

(e) The land to which the certificate relates is the subject of a site audit statement within the meaning of that Act - if a copy of such a statement has been provided at any time to the local authority issuing the certificate.

No

NOTE: **Section 26 of the Nation Building and Jobs Plan (State Infrastructure Delivery) Act 2009 provides that a planning certificate must include advice about any exemption under section 23 or authorisation under section 24 of the Act if the council is provided with a copy of the exemption or authorisation by the Co-ordinator General under that Act.**

Nation Building and Jobs Plan (State Infrastructure Delivery) Act 2009

Council has not been provided with an exemption or authorisation by the Co-ordinator General under the Act.

ATTACHMENTS:

A Extract from Lake Macquarie Local Environmental Plan, 2004 – Schedule 1
B Extract from Lake Macquarie Local Environmental Plan, 2004 – Schedule 2
C Extract from Lake Macquarie Local Environmental Plan, 2004 – Schedules 4, 5 & 6

ATTACHMENT A

Extract from Lake Macquarie Local Environmental Plan, 2004 as at 17 July 2013

Schedule 1 Exempt development

(Clause 8)

Note 1. *State Environmental Planning Policy (Exempt and Complying Development Codes) 2008* specifies exempt development under that Policy.

The Policy has State-wide application. Schedule 1 contains additional exempt development not specified in that Policy.

Note 2. Exempt development may be carried out without the need for development consent under the Act. Such development is not exempt from any approval, licence, permit or authority that is required under any other Act and adjoining owners' property rights and the common law still apply.

1 What is exempt development?

(1) Development is exempt development if:
(a) it is described in Column 1 of the Table to this Schedule, and
(b) it is carried out within a zone specified for the development in Column 2 of that Table, and
(c) it complies with the criteria specified for the development in Column 2 of that Table.
(2) However, development is not exempt development if:
(a) it is prohibited by this plan, or
(b) it is not of minimal environmental impact, or
(c) it is carried out on land described in clause 2 of this Schedule, or
(d) it does not comply with any of the relevant general criteria for exempt development specified in clause 3 of this Schedule.
(3) In measuring heights and maximum areas specified in the Table to this Schedule:
(a) height is measured from natural ground level, and
(b) a maximum area for a structure is the total of all areas occupied by the type of structure, unless otherwise stated.

2 Land on which there is no exempt development

(1) Development is not exempt development if it is carried out on land that:
(a) is critical habitat (within the meaning of the *Threatened Species Conservation Act 1995*), or
(b) is, or is part of, a wilderness area (within the meaning of the *Wilderness Act 1987*), or
(c) is land below the 1 in 100 year flood level if it involves the erection or use of a structure with a habitable room, or land below the 1 in 20 year flood level if it involves the erection or use of a structure with rooms none of which is habitable, except where otherwise indicated in the Table to this Schedule, or
(d) is land to which *State Environmental Planning Policy No 14—Coastal Wetlands* applies, or
(e) is land to which *State Environmental Planning Policy No 26—Littoral Rainforests* applies, or
(f) is identified as an Aboriginal place or known Aboriginal relic on a register kept by the National Parks and Wildlife Service, or is dedicated or reserved under the *National Parks and Wildlife Act 1974*, or
(g) (Repealed)
(h) is land with a slope greater than 15 degrees, or
(i) is identified as potential acid sulfate soil Class 1 or 2 on the Acid Sulfate Soil Planning Maps dated December 1997 and kept by the Council, except where the proposed development does not involve the movement of soils on the site, or
(j) is identified as potential acid sulfate soil Class 3 on the Acid Sulfate Soil Planning Maps dated December 1997 and kept by the Council, where any proposed excavation involved in the development is greater than 500mm, or
(k) is identified as potential acid sulfate soil Class 4 on the Acid Sulfate Soil Planning Maps dated December 1997 and kept by the Council, where any proposed excavation involved in the development is greater than 1.5 metres, or
(l) is within a mine subsidence area, unless the proposed development has been formally approved, prior to commencement, by the relevant Mine Subsidence Board, or
(m) is land on which a tree or native vegetation exists, where the proposed development involves clearing for which consent is required by clause 34, or
(n) is the site of a heritage item or an item proposed by a draft environmental planning instrument to be a heritage item, or
(o) is subject to an order under Division 2A of Part 6 of the *Environmental Planning and Assessment Act 1979* or Division 1 of Part 2 of Chapter 7 of the *Local Government Act 1993*, other than an order to demolish, that has not been complied with, or
(p) is between a foreshore building line and the water body to which that line relates, or
(q) is within 40 metres of a watercourse, river, stream, creek or lake—where excavation of the land (not including footings for minor structures) is proposed, or
(r) is significantly contaminated land within the meaning of the *Contaminated Land Management Act 1997*.

3 Criteria that must be satisfied by all exempt development

Development is exempt development only if it complies with all of the following general criteria relevant to the form of development:
(a) all structures comply with the *Building Code of Australia*, including the standards identified in that code,
(b) all structures and activities comply with the Council's adopted building lines and setbacks, unless otherwise specified in the Table to this Schedule,
(c) the development complies with all relevant development control plans and policies approved by the Council,
(d) no existing condition of development consent or building approval affecting a site is contravened or compromised,
(e) no structure is built over a sewer main, easement or natural watercourse and adequate clearance is provided to all sewer junction shafts, surcharge gullies, hot water service overflow pipes, and waste outlet pipes unless prior written agreement has been obtained from the Council or the local water and sewerage authority or supplier, as the case may require,
(f) the development does not require the installation or alteration of a sewage management facility,
(g) all structures have clearance from power lines in accordance with the relevant electricity authority or supplier,

(h) all structures are built with new materials or second-hand materials which retain the structural adequacy and integrity of the material when new,
(i) all structures are built with materials which match the design and appearance of any existing buildings on the site of the proposed development or in the immediate vicinity,
(j) no structure or activity obstructs vehicular or human access,
(k) no structure is located within the curtilage of a swimming pool which compromises the effectiveness of the swimming pool safety barrier or fence,
(l) all structures and activities comply with relevant legislation affecting their use and with statutory and other requirements of the Council and any other relevant public authorities.

Table

Column 1	**Column 2**
Erection (or installation) and use, or carrying out, of the following:	**Circumstances where exempt**
Amusement devices (being a small amusement device as defined in the *Local Government (General) Regulation 2005*) (eg dodgem cars, giant slides, jumping castles, merry-go-rounds etc)	Exempt only in Zones 3 (1), 3 (2), B4, 6 (1) and 6 (2). Must be installed and used for one day or weekend events only. Must be erected on level ground of sufficient bearing capacity to support the device. Must be registered under the *Occupational Health and Safety Regulation 2001*. Must be erected in accordance with all the conditions set out in its certificate of registration. Must have a current logbook within the meaning of the *Occupational Health and Safety Regulation 2001*. Must be subject to a contract of insurance or indemnity to an unlimited amount or no less than $10,000,000 for each person who would be liable for damages for death or personal injury arising out of the operation or use of the device and any total or partial failure or collapse of the device against that liability. Must meet the operational requirements of the WorkCover Authority.
Arcade amusement devices (eg pinball machines, virtual reality games etc)	Exempt only in Zones 3 (1), 3 (2), B4 and 6 (2). Must be located wholly within the subject premises. Maximum 5 devices installed in total.
Awnings over trade waste disposal points	Exempt only in Zones 4 (1), 4 (2) and 9. Maximum size 30m^2. Maximum height 2.7m. Must facilitate maintenance of the trade waste device and enable all weather use. Must be constructed of materials that match or complement the design and appearance of existing buildings. Must not be located within front building setback.
Charity bins or clothing and recycling bins	Exempt only in Zones 3 (1), 3 (2), B4, 4 (1), 4 (2) and 4 (3). Must not result in more than 3 bins in any one location. Must be located wholly on private property and not in a public place.
Demolition	Exempt in all Zones. Demolition only of development that would be exempt development under this plan if it were being constructed or installed. Council must have issued an order to demolish under Division 2A of Part 6 of the *Environmental Planning and Assessment Act 1979* or section 124 of the *Local Government Act 1993*. Demolition must be carried out in accordance with Australian Standard AS 2601—2001, *Demolition of structures*.
Earthworks (rural)	Exempt only in Zone 1 (1). Must not be for domestic purposes. Must constitute one or more of the following: levelling of land to a maximum of 300mm, maintenance of drainage works, backfilling of dams with not more than 5 megalitres storage capacity, desilting of dams, maintenance of existing access roads within property boundaries.
Fuel tanks—used in conjunction with agricultural activities or home business for which consent has been granted	Exempt only in Zones 1 (1), 1 (2), 7 (2), 7 (3), 7 (5) and 9. Maximum size 5,000 litres. Must be located wholly within the boundaries of the property. Must be bunded with capacity to contain

	at least 125% of the capacity of the fuel tank. Must be constructed of prefabricated metal, be free-standing and not rely on other structures for support. Must be operated and maintained in accordance with Australian Standard AS 1940—2004, *The storage and handling of flammable and combustible liquids.* Must not be erected within 30m of a creek or boundary to the street or within 5m of a side or rear boundary. Minimum setback 20m from adjoining dwellings.
Hail protection	Exempt only in Zones 1 (1) and 1 (2). Must be ancillary to agricultural use and consisting of light construction (eg poles, wire and mesh).
Retaining walls	Exempt in all Zones. Must not be for domestic purposes. Maximum height 600mm (including the height of any batters) above existing ground level. Must have adequate drainage lines behind it. Must not redirect the flow of surface water onto an adjoining property. Must cause surface water to be disposed of without causing a nuisance to adjoining owners. Timber walls must comply with the following Australian Standards: AS 1720.2—2006, *Timber structures—Timber properties*, AS 1720.4—2006, *Timber structures—Fire resistance for structural adequacy of timber members*.
Shade structures (bird nets and the like)	Exempt only in Zone 1 (1). Must be ancillary to agriculture.
Signs (see below for additional requirements for particular sign types) **Note.** The replacement of existing building identification signs and business identification signs (within the meaning of the standard instrument prescribed by the *Standard Instrument (Local Environmental Plans) Order 2006*) is exempt development under *State Environmental Planning Policy (Exempt and Complying Development Codes) 2008.*	Exempt in all Zones (except where otherwise specified below for particular sign types). General criteria: maximum area $2m^2$ in Zone 4 (1), 4 (2) or 4 (3), except as otherwise specified elsewhere in this Table in relation to particular sign types, and maximum area $1m^2$ in all other Zones, except as otherwise specified elsewhere in this Table in relation to particular sign types, and must not cover mechanical ventilation inlet or outlet vents, and over a public road, must be at least 600mm from kerb or roadway edge, and must not be illuminated or use flashing lights or similar devices for illumination, and must not be mounted on vehicles, trailers, or shipping containers that stand continuously for the purpose of advertising on either public or private land, and on public land, must not be mounted on trees or telegraph poles, and must be located so as not to cause or create a traffic hazard including obscuring views of vehicles, pedestrians, or potentially hazardous road features, and must not emit excessive glare or cause excessive reflection, and must not resemble traffic warning signs, and if located on bush fire prone land, must be of non-combustible material.
Signs used for display of the following:	
Business identification signs in residential areas	Only exempt in Zones 2 (1) and 2 (2). Must satisfy general criteria above. Maximum area $1m^2$. Must be located and erected on the site to which they relate. Maximum one sign per street frontage. If over a public road, must be erected at a height no less than 2.6m above ground level.
Business identification signs in commercial areas	Only exempt in Zones 3 (1) and 3 (2). Suspended under awning signs: must satisfy general criteria above, and must be securely fixed by metal supports, and must not affect the structural integrity of the awning or building, and must be located and erected on the site to which they relate, and

	maximum one sign per street frontage, and if over a public road, must be erected at a height no less than 2.6m above ground level, and maximum area 2.5m^2. Vertical or horizontal projecting wall signs: must satisfy general criteria above, and must be securely fixed by metal supports, and must not affect the structural integrity of the awning or building, and must be located and erected on the site to which they relate, and maximum one sign per street frontage, and if over a public road, must be erected at a height no less than 2.6m above ground level, and maximum area 2.5m^2. Flush wall signs: must satisfy general criteria above, and must be securely fixed, and must be located and erected on the site to which they relate, and maximum one sign per street frontage, and maximum area 2.5m^2. Top hamper signs: must satisfy general criteria above, and must be securely fixed, and must be located and erected on the site to which they relate, and maximum one sign per street frontage, and if over a public road, must be erected at a height no less than 2.6m above ground level, and maximum area 2.5m^2.
Business identification signs in industrial areas	Only exempt in Zones 4 (1), 4 (2), 4 (3) and 9. Must satisfy general criteria above. Must be securely fixed by metal supports. If located over a public road, must be erected at a height of no less than 2.6m above ground level. Must be located and erected on the site to which they relate.

	Maximum one sign per street frontage. Maximum area 2.5m^2.
Real estate signs (advertising premises or land for sale or rent) in rural, residential and environmental protection areas	Only exempt in Zones 1 (1), 1 (2), 2 (1), 7 (1), 7 (2), 7 (3), 7 (4) and 7 (5). Must satisfy general criteria above. Maximum area 2.5m^2. Must be freestanding or attached to an existing approved structure eg fence, dwelling house or garage. Must be located and erected on the site to which they relate. Maximum 2 signs per street frontage.
Real estate signs (advertising premises or land for sale or rent) in residential (urban living) areas	Only exempt in Zone 2 (2). Must satisfy general criteria above. Maximum area 4.5m^2. Must be freestanding or attached to an existing approved structure eg fence. Must be located and erected on the site to which they relate. Must not detract from the amenity of adjoining and adjacent land owners. Maximum 2 signs per street frontage.
Real estate signs (advertising premises or land for "open house" or "auction today") in all areas	Exempt in all zones. Maximum area 1.2m^2. Must be erected only on the day the premises or land is open for open house or on the auction day. Must be removed immediately after the open house has finished or the auction has been completed. Maximum one sign at street frontage. Maximum of one sign at each of the nearest 2 intersections. Must not interfere with traffic visibility or pedestrian access. Must not be attached to balloons or similar items. Must not be illuminated or use flashing lights or similar devices for illumination.
Real estate signs (advertising approved premises or land for sale or rent) in commercial, industrial, infrastructure and tourist areas	Only exempt in Zones 3 (1), 3 (2), 4 (1), 4 (2), 4 (3), 5 and 6 (2). Must satisfy general criteria above. Maximum area 10m^2. Must have structural certification. Must be located and erected on the site to which they relate. Maximum 2 signs per street frontage.

	Must not be displayed after 100% of the premises or land is sold or leased.	
Directional real estate signs (advertising approved subdivisions) in rural, residential, commercial, industrial, infrastructure, tourist, natural resource and investigation areas	Only exempt in Zones 1 (1), 1 (2), 2 (1), 2 (2), 3 (1), 3 (2), 4 (1), 4 (2), 4 (3), 5, 6 (2), 9 and 10. Must satisfy general criteria above. In Zones 1 (1), 1 (2), 2 (1) and 2 (2), maximum area 4.5m^2. In Zones 3 (1), 3 (2), 4 (1), 4 (2), 4 (3), 5, 6 (2), 9 and 10, maximum area 6m^2. Two sign boards joined together (eg on a corner site) are treated as 2 separate signs. Must be freestanding or attached to an existing approved structure eg fence, dwelling house or garage. Must be located within a 3km radius of the approved subdivisions to which the signs relate. Maximum of 4 signs within the 3km radius. If the nearest major arterial road or freeway is located outside the 3km radius, 2 additional signs are permitted outside the 3km radius to allow directions to be provided to the premises or land. Must not be displayed after 100% of land is sold. Must relate to approved subdivisions as a whole, not to individual lots.	
Silos	Only exempt in Zone 1 (1). Maximum capacity 120 tonnes. Maximum height 9m. Must be constructed of prefabricated metal. Must be freestanding and not rely on other structures for support. Must be erected in accordance with the manufacturer's specifications or an engineer's certification. Minimum setback to property boundary must be equivalent to height of silo plus 1m. Minimum front setback 30m.	
Temporary structures—tents used for short term accommodation	Only exempt in Zones 1 (1), 1 (2), 2 (1), 2 (2), 6 (2), 7 (1), 7 (2), 7 (3), 7 (4), 7 (5) and 10.	Must be erected on private land (excluding caravan parks, camping grounds and manufactured home estates the operation of which is governed by the *Local Government (Manufactured Home Estates, Caravan Parks, Camping Grounds and Moveable Dwellings) Regulation 2005*). Must be erected in accordance with the manufacturer's specifications and requirements. Must not be erected for a period exceeding 21 consecutive days. Stormwater runoff must not cause a nuisance to adjoining properties. Siting of tents must not create any noise nuisance arising from the use of the tent. Must be setback a minimum 1.5m from all boundaries.

ATTACHMENT B

Extract from Lake Macquarie Local Environmental Plan, 2004 as at 1 June 2010

Schedule 2 Subdivision standards

(Clause 24)

Part 1 Preliminary

1 Definitions

(1) In this Schedule:

building area means the area of the site capable of supporting development. It does not include:
(a) front, side and rear setbacks, or
(b) the access handle of a battle-axe lot.

community association, ***community development lot***, ***community parcel***, ***community property*** and ***community scheme*** have the same meaning as they have in the Community Land Development Act 1989.

irregular lot means a lot that is not a standard lot.

neighbourhood scheme has the same meaning as it has in the Community Land Development Act 1989

standard lot means a rectangular lot (and includes a rectangular corner lot).

width means the distance of the perpendicular line between the side boundaries, as measured at the front building setback.

(2) In this Schedule, the minimum area specified for battle-axe lots excludes the battle-axe access handle.
(3) The subdivision standards in this Schedule do not apply to strata subdivision.
(4) A heading to a clause in this Schedule is taken to be part of this Schedule.

Part 2 Zone 1 (1) Rural (Production)

2 All types of subdivision

Minimum area—20ha.

Part 3 Zone 1 (2) Rural (Living)

3 Subdivisions not for purpose of community, precinct or neighbourhood scheme

Minimum area—1ha.

4 Subdivisions for purpose of community scheme

(1) Community parcel:
minimum area—5ha.

(2) Community development lots:
(a) minimum area—1,000m^2,
(b) maximum area—1,500m^2,
(c) maximum density (excluding community property)—1.6 lots per ha,
(d) must be clustered together, or otherwise established, for the purpose of retaining a significant area of unbuilt open space to preserve the natural quality of the land and the rural character of the area. All remaining land must be community property under the control of the community association,
(e) must not have frontage to a public road unless it can be demonstrated that the subdivision is consistent with the existing subdivision pattern, and the subdivision will preserve the natural and scenic quality of the land.

Part 4 Zone 2 (1) Residential

Note. Also see, in particular, clauses 24, 27 and 28A.

5 Any type of subdivision of approved dual occupancy

Minimum area—250m^2.

6 Any type of subdivision of approved small lot housing

(1) Must create at least 3 small lot housing lots.

(2) Each lot must:
(a) be not less than 300m^2, but not more than 450m^2, in area,
(b) have direct frontage to a public road, or an access way established as part of a community scheme.

7 Subdivisions (other than of approved dual occupancy or approved small lot housing)

(1) Standard lot:
(a) standard corner lot:
(i) minimum area—600m^2,
(ii) minimum width—18m,
(b) other standard lot:
(i) minimum area—450m^2,
(ii) minimum width—14m.

(2) Irregular lot:
(a) battle-axe lot:
(i) minimum area—600m^2,
(ii) must have a rectangular building area with a minimum area of 250m^2 and a minimum width of 12m,
(iii) minimum width of battle-axe access handle servicing 1 battle-axe lot—4m, or 2 battle-axe lots—5m,
(iv) maximum number of battle-axe lots sharing a single access handle—2,
(b) irregular corner lot:
(i) minimum area—600m^2,
(ii) minimum width—18m,
(c) other irregular lot:
(i) minimum area—450m^2,
(ii) must have a rectangular building area with a minimum area of 250m^2 and a minimum width of 12m.

8 Subdivisions (other than of approved dual occupancy or approved small lot housing) that create 10 or more lots

At least 10%, but no more than 50%, of lots must be small lot housing lots.

Part 5 Zone 2 (2) Residential (Urban Living)

Note. Also see, in particular, clauses 24, 27 and 28A.

9 Any type of subdivision of approved small lot housing

(1) Must create at least 4 small lot housing lots.

(2) Each lot must:
(a) be not less than 200m^2, but not more than 450m^2, in area,
(b) have direct frontage to a public road, or an access way established as part of a community scheme.

10 Subdivisions (other than of approved small lot housing)

(1) Standard lot:
(a) standard corner lot:
(i) minimum area—1,200m^2,
(ii) must have a rectangular building area with a minimum area of 900m^2 and a minimum width of 25m,
(b) other standard lot:
(i) minimum area—900m^2,
(ii) minimum width—25m.

(2) Irregular lot:
(a) battle-axe lot:
(i) minimum area—1,500m^2,
(ii) must have a rectangular building area with a minimum area of 900m^2 and a minimum width of 25m,
(iii) minimum width of battle-axe access handle servicing 1 battle-axe lot—8m,
(iv) maximum number of battle-axe lots sharing a single access handle—2,
(b) irregular corner lot:
(i) minimum area—1,200m^2,
(ii) must have a rectangular building area with a minimum area of 900m^2 and a minimum width of 25m,
(c) other irregular lot:
(i) minimum area—900m^2,
(ii) must have a rectangular building area with a minimum area of 900m^2 and a minimum width of 25m.

Part 6 Zone 3 (1) Urban Centre (Core)

11 All types of subdivision

No numeric standards.

Part 7 Zone 3 (2) Urban Centre (Support)

12 All types of subdivision

No numeric standards.

Part 8 Zone 4 (1) Industrial (Core)

13 All types of subdivision

(1) Standard lot:
(a) minimum area—4,000m^2,
(b) minimum width—40m.

(2) Irregular lot:
(a) battle-axe lot:
(i) minimum area—4,000m^2,
(ii) minimum width—40m,
(iii) minimum width of battle-axe access handle—12m,
(iv) maximum number of battle-axe lots sharing a single access handle—2,
(b) other irregular lot:
(i) minimum area—4,000m^2,
(ii) minimum width—40m.

Part 9 Zone 4 (2) Industrial (General)

14 All types of subdivision

(1) Standard lot:

(a) minimum area—1,500m^2,
(b) minimum width—25m.

(2) Irregular lot:
(a) battle-axe lot:
(i) minimum area—1,500m^2,
(ii) minimum width—25m,
(iii) minimum width of battle-axe access handle—9m,
(iv) maximum number of battle-axe lots sharing a single access handle—2,
(b) other irregular lot:
(i) minimum area—1,500m^2,
(ii) minimum width—25m.

Part 10 Zone 4 (3) Industrial (Urban Services)

15 All types of subdivision

(1) Standard lot:
(a) minimum area—1,500m^2,
(b) minimum width—25m.

(2) Irregular lot:
(a) battle-axe lot:
(i) minimum area—1,500m^2,
(ii) minimum width—25m,
(iii) minimum width of battle-axe access handle—9m,
(iv) maximum number of battle-axe lots sharing a single access handle—2,
(b) other irregular lot:
(i) minimum area—1,500m^2,
(ii) minimum width—25m.

Part 11 Zone 5 Infrastructure

16 All types of subdivision

No numeric standards.

Part 12 Zone 6 (1) Open Space

17 All types of subdivision

No numeric standards.

Part 13 Zone 6 (2) Tourism and Recreation

18 All types of subdivision

No numeric standards.

Part 14 Zone 7 (1) Conservation (Primary)

19 All types of subdivision

(1) Minimum area for land within South Wallarah Peninsula (being land east of the Pacific Highway and south of the land to Lake Macquarie Local Environmental Plan 2000 – North Wallarah Peninsula applies)—100ha.

(2) Minimum area for all other land within Zone 7 (1)—40ha.

Part 15 Zone 7 (2) Conservation (Secondary)

20 All types of subdivision

Minimum area—40ha.

Part 16 Zone 7 (3) Environmental (General)

21 Subdivisions not for purpose of community, precinct or neighbourhood scheme

(1) Minimum area—40ha.

(2) Must have a square building area that has:
(a) minimum width—40m,
(b) minimum slope of less than 1 in 5.

22 Subdivisions for purpose of community scheme

(1) Community parcel:
minimum area—40ha.

(2) Community development lots:
(a) minimum area—1,000m^2,
(b) maximum area—2,500m^2,
(c) maximum density (excluding community property)—1 lot per 10ha,
(d) must be clustered together, or otherwise established, for the purpose of retaining a significant area of unbuilt open space to preserve, maintain and enhance the natural and scenic quality of the land,
(e) all remaining land must be community property under the control of the community association,
(f) must not have frontage to a public road unless it can be demonstrated that the subdivision is consistent with the existing subdivision pattern, and the subdivision will preserve the natural and scenic quality of the land.

Part 17 Zone 7 (4) Environmental (Coastline)

23 All types of subdivision

No numeric standards.

Part 18 Zone 7 (5) Environmental (Living)

24 Subdivisions not for purpose of community, precinct or neighbourhood scheme

(1) Minimum area—2ha.

(2) Must have a square building area that has:
(a) minimum width—40m,
(b) minimum slope of less than 1 in 5.

25 Subdivisions for purpose of community scheme

(1) Community parcel:
minimum area—10ha.

(2) Community development lots:
(a) minimum area—600m^2,
(b) maximum area—1,200m^2,
(c) maximum density (excluding common property)—1 lot per ha,
(d) must be clustered together, or otherwise established, for the purpose of retaining a significant area of unbuilt open space to preserve, maintain and enhance the natural and scenic quality of the land,
(e) all remaining land must be community property under the control of the community association,
(f) must not have frontage to a public road unless it can be demonstrated that the subdivision is consistent with the existing subdivision pattern, and the subdivision will preserve the natural and scenic quality of the land.

Part 19 Zone 8 National Park

26 All types of subdivision

No numeric standards.

Part 20 Zone 9 Natural Resources

27 All types of subdivision

No numeric standards.

Part 21 Zone 10 Investigation

28 All types of subdivision

Subdivision prohibited.

24 Subdivision

(1) Despite any other provision of this plan, subdivision of land, other than that identified in subclause (9), may be carried out only with development consent.

(2) Land in any zone may be subdivided only if the consent authority is satisfied:
(a) that the resulting lots will conform to the requirements in Schedule 2 (Subdivision standards) applicable to subdivision in that zone, and
(b) the resulting lots can be developed in accordance with this plan.

(3) To avoid doubt State Environmental Planning Policy No 1 – Development Standards applies to a requirement referred to in subclause (2) (a) in the same way as it applies to a development standard.

(4) Consent must not be granted to a subdivision of land in Zone 2 (1) or 2 (2) for the purpose of small lot housing unless consent has been or is also given to the erection on the land of dwellings that will comprise small lot housing.

(5) Consent must not be granted for a subdivision of land in Zone 2 (1) for the purpose of dual occupancy-attached or dual occupancy-detached unless consent has been or is also granted for the erection on the land of dwellings comprising that form of dual occupancy.

(6) (Repealed)

(7) The subdivision of land in Zone 2 (1) or 2 (2) for small lot housing is prohibited if it would result in the creation of any battle-axe lots.

(8) The subdivision of land in Zone 10 is prohibited.

(9) Consent is not required for a subdivision for the purpose only of any one or more of the following:
(a) widening a public road,
(b) a minor realignment of boundaries that does not create:
(i) additional lots or the opportunity for additional dwellings, or
(ii) lots that are smaller than the minimum size provided for by this plan in relation to the land concerned,

(c) a consolidation of lots that does not create additional lots or the opportunity for additional dwellings,

(d) rectifying an encroachment on a lot,

(e) creating a public reserve,

(f) excising from a lot land that is, or is intended to be, used for public purposes, including drainage purposes, rural fire brigade or other emergency service purposes or public toilets.

27 Dwelling houses, small lot housing and dual occupancies in Zone 1(2), 2(1), 2(2) or 7(5)

(1) This clause applies to land in Zone 1 (2), 2 (1), 2 (2) or 7 (5).

(2) In this clause:

dwelling lot means a lot that:

(a) was a lawfully created lot at the commencement of this plan, or

(b) is a lot lawfully created after that commencement under a development consent granted before or after that commencement, or

(c) complies with such of the requirements set out in Schedule 2 (Subdivision standards) as apply to the land comprising the lot.

(3) A dwelling must not be erected or created on land to which this clause applies, except in accordance with this clause.

(4) Consent may be granted for the erection or creation of:
(a) a dwelling house on a dwelling lot in Zone 2 (2), or
(b) a dwelling house or dual occupancy-attached on a dwelling lot in Zone 1 (2) or 7 (5), or

(c) a dwelling house, dual occupancy-attached or dual occupancy-detached on a dwelling lot in Zone 2 (1).

(5) Consent must not be granted for the erection or creation of a dwelling house, dual occupancy-attached or dual occupancy-detached on a dwelling lot if its erection or creation would mean:
(a) if the lot is in Zone 1 (2), 2 (1), 2 (2) or 7 (5)—that there is more than one dwelling house on the dwelling lot (counting any dwelling house already on the lot), or
(b) if the lot is in Zone 1 (2), 2 (1) or 7 (5)—that there are more than two dwellings on the dwelling lot (counting any dwelling already on the lot).

(6) Consent must not be granted for the erection or creation of a dual occupancy-attached or dual occupancy-detached on a neighbourhood lot in Zone 1 (2) or 7 (5).

(7) Consent must not be granted for the erection or creation of a dual occupancy-attached or dual occupancy-detached on a battle-axe lot in Zone 2 (1).

(8) Consent must not be granted for the erection or creation of small lot housing in Zone 2 (1) or 2 (2):
(a) on a battle-axe lot, or
(b) on a lot less than 1,000 square metres in area.

(9) Consent must not be granted to the erection or creation in Zone 2 (1) of:
(a) a dual occupancy-attached on a lot less than 500 square metres in area, or
(b) a dual occupancy-detached on a lot less than 600 square metres in area.

28A Residential flat buildings and multiple dwelling housing in Zone 2(2)

(1) Consent must not be granted to the erection or creation of a residential flat building on:
(a) an irregular or standard corner allotment in Zone 2 (2) unless the allotment has a minimum area of 1,500 square metres and a minimum width of 30 metres, or
(b) a battle-axe allotment in Zone 2 (2) unless the allotment has a minimum area of 2,000 square metres and the battle-axe access handle has a minimum width of 8 metres, or

(c) any other irregular allotment or standard allotment in Zone 2 (2) unless the allotment has a minimum area of 1,200 square metres and a minimum width of 30 metres.

(2) Consent must not be granted to the erection or creation of multiple dwelling housing on:
(a) a corner allotment in Zone 2 (2) unless the allotment has a minimum area of 1,200 square metres and a minimum width of 30 metres, or
(b) a battle-axe allotment in Zone 2 (2) unless the allotment has a minimum area of 1,500 square metres and the battle-axe access handle has a minimum width of 8 metres, or

(c) any other allotment in Zone 2 (2) unless the allotment has a minimum area of 900 square metres and a minimum width of 25 metres.

(3) In this clause:

width means the distance of the perpendicular line between the side boundaries, as measured at the front building setback.

ATTACHMENT C

Extract from Lake Macquarie Local Environmental Plan, 2004 as at 17 July 2013

Schedule 4 Heritage items other than of indigenous origins and including potential archaeological sites

(Clause 51 and Dictionary)

Part 1 Heritage items other than of indigenous origins

In this Schedule, for the purpose of listing property descriptions, the symbol *S* means identified as of State significance, *R* means identified as of regional significance, *L* means identified as of local significance, *PO* means Permissive Occupancy, *MS* means miscellaneous, *MD* means Maitland and *SP* means strata plan.

Item No	Significance	Item	Address	Property description
Argenton				
AG-01	L	Newcastle Mines Rescue Station	533 Lake Rd	Lot 2, DP 599235
AG-02	L	Former Cockle Creek Railway Bridge	2 (over) Cockle Creek (also see RT-09)	
AG-03	L	Cockle Creek Railway Bridge	3 (over) Cockle Creek (also see RT-03)	
AG-05	L	Church Hall and Anglican Church	477 Lake Rd 475 Lake Rd	Lot 1, DP 125686 Lot 2, DP 125686
AG-06	L	Speers Point Tram Route	Frederick St (also see RT-02)	
Awaba				
AW-03	L	Former Awaba Union Church	20 Gosford St	Lot 1, Section 8, DP 758041
AW-05	L	Gatekeeper's Cottage	154 Wilton Road	Lot 1, DP 817297
Barnsley				
BY-02	L	Johnston Family Cemetery	14A Taylor Ave	Lot 100, DP 630296
BY-03	L	Former Barnsley Public School	91 Appletree Rd	Lot 2, DP 1001812
Belmont				
BM-01	L	House "Yarragee"	23 Bellevue Rd	Lot 1, DP 881605
BM-04	L	Captain Bain's House	15 George St	Lot 2, DP 13715
BM-05	L	House "The Bennals"	45 Walter St	Lot D, DP 402085
BM-08	L	Former Ferry Wharf	55 Brooks Pde	Belmont Wharf
Belmont North				
BN-01	L	Former John Darling Colliery	14 John Darling Ave 65 John Fisher Rd 85 John Fisher Rd 75 John Fisher Rd	Lot 100, DP 1136505 Lot 1, DP 814551 Lot 2, DP 814551 Lot 3, DP 814551
BN-04	L	Former Staff Houses, Colliery Row	3 Maranatha Cl 7 Maranatha Cl 9 Maranatha Cl 21 Maranatha Cl	Lot 12, DP 848941 Lot 14, DP 848941 Lot 15, DP 848941 Lot 120, DP 853391
Belmont South				
BS-02	L	Tank traps	Cold Tea Creek, 690A Pacific Hwy	Lot 7024, DP 1057186
Blackalls Park				
BK-02	L	Railway Bridges	2 (over) Mudd Creek and 2 (over) Stony Creek (also see RT-11)	
BK-03	L	Railway Station	26 South Pde (also see RT-11)	
Boolaroo				
BR-01	L	Group of 4 Cottages	8 Creek Reserve Rd 10 Creek Reserve Rd 12 Creek Reserve Rd 14 Creek Reserve Rd	Lot 11, DP 616785 Lot 1, DP 301687 Lot 3, DP 8704 Lot 4, DP 8704
BR-02	L	Former Boolaroo Post Office	91 Main Rd	Lot 2, DP 809177

BR-04	L	Former Motor Garage	19 Main Rd	Lot 1, DP 125272
BR-05	L	Commercial Hotel	2 Main Rd	Lot 1, Section A, DP 3494, Lot 2, Section A, DP 3494
BR-06	L	House "Alida"	Lakeview Rd	Lot 4, Section M, DP 3494
BR-16	L	Former Laboratory building on the former Pasminco site	Part of 13A Main Rd	Part of Lot 2, DP 1127713
Booragul				
BU-01	L	Colliery Relics	155 Old Main Rd	Lot 33, DP 858667
BU-02	L	House "Awaba Park"	18 Marmong St 2b First St	Lot 120, DP 855520 Lot 33, DP 1133743
BU-03	L	Quigley Grave	24 Park Pde	Pt Lot 468, DP 774186
Cams Wharf				
CW-01	L	Lord of the Manor Cams Cottage	13 Cams Wharf Rd	Lot 2, DP 616354
Cardiff				
CF-01	L	Row of 4 Shops with Cottages	275 Main Rd 279 Main Rd	Lot 21, DP 544989 Lot 22, DP 544989
CF-02	L	Brick Shops	281 Main Rd	Lot 4, DP 10789
CF-04	L	Former Doctor's Surgery	8 Michael St	Lot 2, DP 214463
CF-05	L	House	6 Michael St	Lot 1, DP 214463
CF-08	L	Cardiff Masonic Hall	4 Margaret St	Lot 12, Section B, DP 8186
CF-09	L	House	309 Main Rd	Pt Lot 34, DP 755233
CF-15	L	St Kevin's Cottage	230 Main Rd	Lot 1, DP 1015805
CF-16	L	St Kevin's Church	226 Main Rd	Lot 3, Section A, DP 4143
CF-17	L	Former Miner's Cottage	251 Main Rd	Lot 1, DP 303203
Cardiff South				
CS-01	L	Former Colliery Tramway	14a Almora Cl 180 Macquarie Rd 235 Macquarie Rd (also see RT-15)	Lot 38, DP 827464 Lot 17, DP 727746 Lot 673, DP 805546

Catherine Hill Bay

CH-03	L	Police Station and Lock Up	23–27 Clarke St	Lot 1, Section F, DP 163, Lot 3, Section F, DP 163, Lot 5, Section F, DP 163
CH-04	L	Wallarah Hotel	24 Clarke St	Lot 1, Section D, DP 163
CH-05	L	Cottages	10 Clarke St 12 Clarke St	Lot 71, DP 222717 Lot 72, DP 222717
CH-06	L	Cottages	21 Clarke St 19 Clarke St	Lot 78, DP 222717 Lot 79, DP 222717
CH-07	L	Cottage	17 Clarke St	Lot 80, DP 222717
CH-08	L	Cottages	9 Clarke St 7 Clarke St 5 Clarke St 3 Clarke St	Lot 84, DP 222717 Lot 85, DP 222717 Lot 86, DP 222717 Lot 87, DP 222717
CH-10	L	Cottage	3 Lindsley St	Lot 54, DP 222717
CH-12	L	Cottage	11 Lindsley St	Lot 58, DP 222717
CH-14	L	Coal Loader Jetty	Southern end of the beach	Lot 104, DP 1129872
CH-17	L	House and 4 Norfolk Pines	38 Flowers Dr	Lot 22, DP 593154
CH-19	L	Anglican Church	71 Flowers Dr	Lot 21, DP 593154
CH-21	L	Group of cottages	27 Flowers Dr 29 Flowers Dr 31 Flowers Dr 33 Flowers Dr 35 Flowers Dr 37 Flowers Dr 42 Flowers Dr 44 Flowers Dr 46 Flowers Dr 48 Flowers Dr 50 Flowers Dr 54 Flowers Dr 56 Flowers Dr 58 Flowers Dr	Lot 14, DP 222943 Lot 15, DP 222943 Lot 16, DP 222943 Lot 17, DP 222943 Lot 18, DP 222943 Lot 19, DP 222943 Lot 41, DP 222943 Lot 42, DP 222943 Lot 43, DP 222943 Lot 44, DP 222943 Lot 45, DP 222943 Lot 47, DP 222943 Lot 48, DP 222943 Lot 49, DP 222943
CH-22	L	Hall	1 Northwood Rd	Lot 1, DP 407474
CH-24	L	House	26 Flowers Dr	Lot 1, DP 1107593
CH-27	L	House	38 Flowers Dr (off Colliery Rd)	Lot 223, DP 1102989
CH-32	L	Cemetery	8 Northwood Rd	Lot 7079, DP 1029250

CH-34	S	Former WWII RAAF Radar Station 208	145 Mine Camp Rd	Lot 16, DP 755266 Lot 3, DP 1016670
Charlestown				
CT-01	L	Miners' Cottages	300 Charlestown Rd 304 Charlestown Rd 306 Charlestown Rd 308 Charlestown Rd	Lot 2, DP 33470 Lot 4, DP 33470 Lot 5, DP 33470 Lot 6, DP 33470
CT-03	L	Cottage	32 Smith St	Lot 1, DP 213865
CT-04	L	Brick Cottage	36 Smith St	SP 43904
Coal Point				
CP-01	L	Threlkeld's Mine	359 Coal Point Rd	Lot 172, DP 1037893
Cooranbong				
CB-01	L	Grave "Frost's Rest"	54 Mannings Rd	Lot 1, DP 919600
CB-02	L	Catholic Church and Cemetery	6 Martinsville Rd	Lot 1, DP 197852
CB-03	L	Former Post Office	41 Martinsville Rd	Lot 120, DP 755223
CB-06	L	House	9 Kings Rd	Lot 3, DP 549007
CB-07	L	House	85 Kings Rd	Lot 1, DP 798409
CB-08	L	North Corrumbung Cemetery	200 Martinsville Rd	Lot 7300, DP 1145113 Lot 1, DP 1095988
CB-09	L	Suspension Footbridge	Off Victory St—Crosses Dora Creek	
CB-17	L	Water Tower	15 Central Rd	Lot 20, DP 3534
CB-18	L	Bethel Hall	50 Central Rd	Lot 18, DP 129134
CB-21	L	College Hall	50 Central Rd	Lot 18, DP 129134
CB-22	L	Science Hall	50 Central Rd	Lot 18, DP 129134
CB-23	L	House "The Laurels"	50 Central Rd	Lot 18, DP 129134
CB-24	L	Auditorium	50 Central Rd	Lot 9, Section 7, DP 3533
CB-26	L	Sanitarium Health Foods Factory	70 Central Rd 70 Central Rd	Lots 6, 7 and 8, Section 1, DP 3533 Lot 1, DP 938761
			50 Central Rd 50 Central Rd	Lot 18, DP 129134
CB-27	L	Sanitarium Dairy Farm	15 Central Rd	Lots 18 to 23, Section 3, DP 3533
CB-28	L	House "Three Bells"	597 Freemans Dr	Lot 201, DP 1059478
CB-29	L	Cottage	661 Freemans Dr	Lot A, DP 416525
CB-31	L	House "Sunnyside"	27 Avondale Rd	Lot 2, DP 204207
Dora Creek				
DC-02	L	House	16 Dora St	Lot 11, DP 533825
DC-03	L	Holmes Store	3 Watt St	Lot 38, DP 528601
DC-04	L	Former St Paul's Anglican Church	26 Coorumbung Rd	Lot 101, DP 840020
Dudley				
DL-01	L	Cast Iron Reservoir	147 Ocean St	Lot 1, 446723
DL-02	L	Dudley Monument	Corner of Redhead Rd and Ocean St	Lot 189, DP 755233
DL-03	L	Two Miner's Cottages	125 and 127 Ocean St	Lot 3, Section D, DP 2657 and Lot 11, DP 1150274
DL-04	L	Dudley Public School	124 Ocean St	Lot 145, DP 755233
DL-06	L	Pensioners Hall	98 Ocean St	Lot 1, DP 931771
DL-07	L	Ocean View Hotel	85 Ocean St	Lot 20, Section A, DP 2304
DL-08	L	Royal Crown Hotel	94 Ocean St	Lot 18, Section B, DP 2304
DL-09	L	Former Miner's Cottage	31 Thomas St	Lot 9, Section D, DP 2657
DL-10	L	Former Miner's Cottage	29 Thomas St	Lot 11, Section D, DP 2657
Edgeworth				
EW-07	L	School Teacher's Residence	7 Minmi Rd	Lot 106, DP 755262
Eraring				
ER-01	L	Eraring Power	268 Rocky Point	Lot 11, DP 1050120

		Station	Rd, Eraring 294 Rocky Point Rd, Eraring 115 Construction Rd, Myuna Bay 215 Construction Rd, Myuna Bay 235 Construction Rd, Myuna Bay 260 Construction Rd, Myuna Bay	Lot 10, DP 1050120 Lot 50, DP 840671 Lot 20, DP 840668 Lot 211, DP 840670 Lot 51, DP 840671
Fassifern				
FF-01	L	Fassifern Railway Cottage	Wallsend Rd	Lot 1, DP 854050
FF-02	L	Toronto Railway Overbridge	(over) Fassifern Rd (also see RT-11)	
FF-03	L	Fassifern Railway Station	29 Fassifern Rd	
Freemans Waterhole				
FW-01	L	Headframe Former Mining Museum	890A Freemans Dr	Lot 80, DP 610602
Glendale				
GD-01	L	Cardiff Railway Workshops	460 Main Rd	Lot 100, DP 1100258
Holmesville				
HV-04	L	Brick House	47 Appletree Rd	Lot 3, Section B, DP 4479
HV-06	L	Brick House	54 Appletree Rd	Lot 22, DP 740832
HV-07	L	House	20 William St	Lot 14, Section E, DP 5432
HV-08	L	Former Police Station	20 Charlotte St	Lot 15, Section E, DP 5432
HV-09	L	Post Office Store	18 George St	Lot 1, Section L, DP 3442
HV-11	L	Holmesville Hotel	21 George St	Lot 20, Section M, DP 3442
HV-20	L	House	32 Seaham St	Lot 42, Section B, DP 4479
HV-24	L	Railway Station	Killingworth Rd (also see RT-09)	
HV-25	L	Former Uniting Church	29 Helens St	Lot 16, Section N, DP 3442
Kahibah				
KH-01	S L	Glenrock Railway and Mine Entrance and early coal mining sites	Glenrock State Recreation Area	Lot 1, DP 523208 and Lot 21, DP 575387
Killingworth				
KW-02	L	Elcom Newcastle Substation	101 Killingworth Rd	Lot 1, DP 619513 Lot 2, DP 619513
KW-03	L	Former Killingworth Hotel	39 Killingworth Rd	Lot 13, Section E, DP 4339
KW-05	L	Soldier's Memorial	26 The Broadway	Lot 1, Section D, DP 4339
Kotara South				
KS-01	L	South Waratah Colliery	31 Kirkdale Dr (also see RT-06)	Lot 132, DP 243393
Little Pelican				
LP-01	L	Little Pelican cottages and site		Lot 7036, DP 1030788
Marks Point				
MK-01	L	House	15 Haddon Cr	Lot 1, DP 124241
Martinsville				
MV-01	L	Public School	495 Martinsville Rd	Lot 157, DP 823773
MV-02	L	House "Woodside"	32 Wilkinson Rd	Lot 1, DP 741192
MV-03	L	Dora Creek Bridge	Owens Rd	
MV-04	L	Farm House "Wonga Hill"	324 Owens Rd	Lot 63, DP 661760
MV-08	L	Former Union Church	447 Martinsville Rd	Lot A, DP 4329
Morisset				
MS-01	L	Stationmaster's	58 Dora St	Pt Lot 1, DP 1002965

		House		
MS-02	L	Community Hall	77 Dora St	Lot 2, DP 590896
MS-04	L	Mullard Chambers building	71 Dora St	Lot 1, DP 215590
MS-08	L	Morisset High School	33 Bridge St	Lot 3, Section 40, DP 758707
MS-10	L	Tree—Morisset's Campsite	147 Macquarie St	Lot 7045, DP 93593
MS-12	S L	Morisset Hospital Wards 5 and 6	84 Bridge Street, Morisset	Lot 1, DP 880557
MS-13	S L	Morisset Hospital Ward 9, Clinical Dept	84 Bridge Street, Morisset	Lot 1, DP 880557
MS-14	S L	Morisset Hospital Ward 10	84 Bridge Street, Morisset	Lot 1, DP 880557
MS-15	S L	Morisset Hospital The Chapel	84 Bridge Street, Morisset	Lot 1, DP 880557
MS-16	S L	Morisset Hospital Recreation Hall	84 Bridge Street, Morisset	Lot 1, DP 880557
MS-17	S L	Morisset Hospital The Main Store	69a Fishing Point Rd, Bonnells Bay	Lot 1 DP 880557
MS-19	S L	Morisset Hospital Residence No 1	69a Fishing Point Rd, Bonnells Bay	Lot 1 DP 880557
MS-20	S L	Morisset Hospital Ward 17, General Psychiatry	69a Fishing Point Rd, Bonnells Bay	Lot 1 DP 880557
MS-23	S L	Morisset Hospital Ward 12	69a Fishing Point Rd, Bonnells Bay	Lot 1 DP 880557
MS-24	S L	Morisset Hospital Residence No 3	69a Fishing Point Rd, Bonnells Bay	Lot 1 DP 880557
MS-25	S L	Morisset Hospital Maximum Security Division	69a Fishing Point Rd, Bonnells Bay	Lot 1 DP 880557
MS-26	S L	Morisset Hospital Cottage Row Residence Nos 16, 17, 18, 19, 20 and 21	69a Fishing Point Rd, Bonnells Bay	Lot 1 DP 880557
MS-29	S L	Morisset Hospital Water Supply Dam—Pourmalong Creek	69a Fishing Point Rd, Bonnells Bay	Lot 1 DP 880557

Nords Wharf

NW-01	L	Former Guesthouse "Kurrawilla"	127 Marine Pde	Lot 4 to 9, DP 23483
NW-02	L	"Nords Wharf"	43c Nords Wharf Rd	PO 1970/126

Pelican

PF-01	L	Cabbage Trees	5 Soldiers Rd	Lot 135, DP 1151226

Railways and tramways

RT-01	L	West Wallsend Steam Tram Line	West Wallsend to Newcastle via Wallsend, Holmesville, Estelville, Edgeworth and Glendale	
RT-02	L	Speers Point Steam Tram Line	Newcastle to Speers Point via West Wallsend	
RT-03	L	Great Northern Railway	Line passes through Lake Macquarie from Garden Suburb to Wyee	
RT-04	L	Belmont Railway	Adamstown to Belmont, the New Redhead Estate and Coal Company Railway	
RT-05	L	Branch Lines from the Belmont Railway	Burwood No 3 Colliery, Whitebridge, Dudley Colliery, Dudley, Lambton Colliery, Redhead, John Darling Colliery, Belmont North, Belmont Colliery Sidings, Belmont	Lots 1, 2 and 9, DP 1038830
RT-06	L	Raspberry Gully Line Railway	Opposite Dalpura Lane to the Main	

			Northern Railway Line, near Adamstown along Styx Creek	
RT-09	L	Seaham, West Wallsend, Fairley and Killingworth Railway	Cockle Creek to Seaham No 1 Colliery at Seahampton with branches to Fairley and Killingworth	
RT-10	L	Rhondda Colliery Railway	From West Wallsend railway on the northside of Stockton Borehole Colliery to the Rhonda Colliery south of Rhonda Rd, Teralba	
RT-11	L	Fassifern to Toronto Branch Railway Line	Fassifern Railway Station to Toronto Railway Station and then Toronto Wharf	
RT-14	L	Wyee Coal Conveyor Railway Loop	North of Wyee to Vales Point Power Station	
RT-15	L	Cardiff South Colliery Tramway	Macquarie Rd, Cardiff South	
Rathmines				
RM-00	S	Rathmines Park (former RAAF Seaplane Base)	Area bounded by Lake Macquarie, The Circlet, Rosemary Row and Overhill Rd	Lots 37–49, Pt Lot 50 and Pt Lot 51, DP 11537 Lot 4, DP 704472 Lot 1, DP 226530 Lot 1, DP 226531 Lot 1, DP 226532 Lot 1, DP 226533 Lot 1, DP 226534 Lot 7, DP 516152 Lot 60, DP 584602 Lots 62–64, DP 596913 Lots 648 and 654, DP 806611
RM-01	L	Catalina Memorial Nursing Home	171 Dorrington Rd	Lot 2, DP 226531
RM-02	L	Community Hall	1 Overhill Rd	Lot 64, DP 596913
RM-03	L	Catamaran Club	1 Overhill Rd	Lot 64, DP 596913
RM-04	L	Christadelphian School	2 Stilling St	Lot 5, DP 226534
RM-05	L	Flying Boat Ramps	1 Overhill Rd	Lot 64, DP 596913
RM-06	L	Rathmines Bowling Club	1 Stilling St	Lot 4, DP 226533
RM-07	L	Catalina War Memorial	1 Overhill Rd	Lot 64, DP 596913
RM-08	L	Rathmines Holiday Camp	3 Stilling St	Lot 1, DP 226530
RM-09	L	Brick Store	1 Overhill Rd	Lot 64, DP 596913
RM-10	L	Boat Slip	1 Overhill Rd	Lot 64, DP 596913
RM-12A	L	Emergency Radio Bunkers	115 Wangi Rd	Lot 466, DP 1138964
Redhead				
RH-01	L	Lambton Colliery	1 Geraldton Dr	Lot 68, DP 878840
RH-03	L	Under-Manager's House	17 Geraldton Dr	Lot 7, DP 878840
RH-04	L	"The Gables"	87 Redhead Rd	Lot 4, DP 737493
RH-07	L	Mine Manager's House	21 Elsdon St	Lot 100, DP 609787
RH-08	L	Shark Tower	2A Beach Rd	Lot 1412, DP 755233
Speers Point				
SP-03	L	House	10 Council St	Lot 1, DP 518527
SP-04	L	House	8 Council St	Lot 1, DP 521920
SP-08	L	House	18 Alley St	Lot 11, DP 525378
SP-09	L	House	37 Alley St	Lot 1, DP 587774
SP-10	L	Cottage	64 Speers St	Lot 1, DP 348879
SP-11	L	House	66 Speers St	Lot 3, DP 562487
SP-12	L	House	41 Albert St	Lot 1, DP 962726
SP-13	L	House	74 Speers St	Pt Lot 1, DP 956798
SP-14	L	House	214 The Esplanade	Lot 1, DP 108865
SP-16	L	House "The Knoll"	374 The Esplanade	Lot 3, DP 786053
SP-17	L	House	332 The Esplanade	Lot 4, DP 350608
SP-19	L	House	302 The Esplanade	Lot 32, DP 564214
SP-23	L	House	282 The Esplanade	Lot 145, DP 558308

SP-25	L	Former Lake Macquarie Council Chambers	143 Main Rd	Lot 13, DP 810700
SP-26	L	House	141 Main Rd	Lot 1, DP 368588
SP-29	L	Speers Point Garage	155 Main Rd	Lot 12, Section A, DP 4063
SP-30	L	House "Shangrila"	157 Main Rd	Lot 11, Section A, DP 4063
SP-31	L	House	159 Main Rd	Lot 10, Section A, DP 4063
SP-34	L	Lakeview Street Theatre	81 Lakeview St	Lot 14, Section B, DP 4063
SP-36	L	Shelter Shed	15 Park Rd	Lot 1, DP 998238
SP-37	L	Minenwerfer (or German Mortar)	15 Park Rd	Lot 1, DP 998238
Swansea				
SS-02	L	The Swansea Hotel	196 Pacific Hwy	Lot 12, DP 1101804
Swansea Heads				
SD-02	L	Coast Guard Station	3a Lambton Pde	Lot 548, DP 39981
SD-03	L	Reid's Mistake, Head and Channel	7a Lambton Pde	Pt Reserve 88033
Teralba				
TA-03	L	Shop	10 Anzac Pde	Lot 1, DP 999965
TA-08	L	House "Moria"	59 York St	Lot 17, DP 816302
TA-09	L	Teralba Public School	57 York St	Lot 2, DP 795123
TA-10	L	Great Northern Hotel	2 Anzac Pde	Lot 7, Section A, DP 447469
TA-11	L	House "AS"	101 Railway St	Lot 261, DP 554269
TA-12	L	Station Master's Cottage	150 Railway St	Lot 3, DP 831957
TA-13	L	Teralba Cemetery Billygoat Hill	20 Pitt St	Lot 31, DP 858667
TA-16	L	Gartlee Mine	159 Railway St	Lot 102, DP 1131669
TA-17	L	Rhondda Colliery	282 Rhondda Rd 284 Rhondda Rd	Lot 101, DP 1073163 Lot 76, DP 755262
TA-18	L	Former Co-operative Store	75 York St	Lot 18, DP 1158353
TA-25	L	St Hilda's Church	16 York St	Lot 4, DP 1128610
Toronto				
TT-01	L	House "Manuka"	182 Excelsior Pde	Lot 461, DP 589541
TT-06	L	House "The Moorings"	2 Jarrett St	Lot 1, DP 1108227
TT-08	L	Toronto Cemetery	354 Awaba Rd	Lots 7044 to 7046, DP 1052029 and Lot 7058, DP 1052031
TT-09	L	Toronto Hotel	74 Victory Pde	Lot 201, DP 549239
TT-11	L	Former Railway Station	16 Victory Row	Lot 220, DP 1021925
TT-12	L	Frith's Store	66–74 The Boulevarde	Lot 1, DP 1154114
TT-15	L	Building Restaurant	24 Victory Pde	Lot 1, DP 301366
TT-16	L	Royal Motor Yacht Club Annexe	8 Arnott Ave	Lot 12 to 15, DP 456286
TT-17	L	Building Restaurant	6 Arnott Ave	Lot X, DP 406274, Pt Lot 424, DP 823708, Lot 1, DP 917503
TT-18	L	Boatman's Cottage Lakefront	4 Arnott Ave	Lot 1, DP 950464
TT-19	L	Boathouse and Winches Lakefront	4 Arnott Ave	Lot 1, DP 950464 PO 65/60
TT-20	L	House	4 Arnott Ave	Lot 1, DP 950464
TT-21	L	House "Burnbrae"	32 Renwick St	Lot 1, DP 122786
TT-22	L	Station Master's Cottage	98 Brighton Ave	Lot 1, DP 125979
TT-23	L	House "McGeachie's"	109 Brighton Ave	Lot 2, DP 515029
TT-29	L	Convent of Mercy	26 Renwick St	Lot 2122, DP 1116609
TT-30	L	House	23 Renwick St	Lot 2, DP 350492
TT-38	L	Cottage	6 Renwick St	Lot 21, Section 7, DP 4236

TT-42	L	House	16 Hunter St	Lot 111, DP 596414
TT-43	L	Winn's House	19 Hunter St	Lot 100, DP 717511
Wangi Wangi				
WG-01	S L	Wangi Power Station	80 Donnelly Rd	Lot 101, DP 880089
WG-04	L	House "Dobell House"	47 Dobell Dr	Lot 13, DP 8840
WG-06A	L	Gun emplacements	24 Reserve Rd	Lot 526, DP 662836
Warners Bay				
WB-01	L	House "Ali's Palace"	6 Fairfax Rd	Lot 2, DP 20222, Lot 34, DP 20222, Pt Lot 1, DP 20222
WB-02	L	First Orange Orchard	The slope with north eastern aspect falling from crest of hill at corner Beryl and Mills Sts down to creek and tramway	(WB-03)
WB-03	L	Mine Pithead and Coal Tramway to Lake	Follows creek from below Barbara St, to Lake between Howard and James Sts	
WB-04A	L	Cottage	17 Daydawn Ave	Lot 10, DP 651218
West Wallsend				
WW-01	L	West Wallsend Football Club Ground	3 Laidley St, Johnson Park	Lot 1, DP 421411
WW-02	L	West Wallsend (No 1) Colliery	off Wilson St	Pt Lot 106, DP 1000408
WW-05	L	Cottage	12 Carrington St	Lot 6, Section Z, DP 3809
WW-06	L	Cottage	15 Carrington St	Lot 15, Section D, DP 2252
WW-08	L	House "Earsdon Cottage"	20 Carrington St	Lot A, DP 370073
WW-10	L	Former Shop and Doctors surgery	47 Carrington St	Lot 16, Section C, DP 2252
WW-11	L	House	47 Carrington St	Lot 16, Section C, DP 2252
WW-12	L	Former Shop and House	52 Carrington St	Lot 2, Section G, DP 2252
WW-13	L	Post Office and Residence	54 Carrington St	Lot 1, Section G, DP 2252
WW-14	L	Catholic Church and Convent	5 Hyndes St	Lot 15, Section G, DP 2255, Lot 16, Section G, DP 2252, Lot 1, DP 500232, Lot 2, DP 500232
WW-15	L	Soldiers' Memorial and Park	49 Carrington St	Lot 1, DP 301342
WW-16	L	Workers' Club	51 Carrington St	Lot 11, DP 863266
WW-18	L	Clyde Inn Hotel	57 Carrington St	Lot 12, Section B, DP 2252
WW-19	L	House	59 Carrington St	Lot A, DP 382915
WW-23	L	Former School of Arts	65 Carrington St	Lot 21, DP 875161
WW-26	L	West Wallsend Co-Op	76a Carrington St 6 Withers St 8 Withers St	Lot 7, Section E, DP 2252 Lot 8, Section E, DP 2252 Lot 9, Section E, DP 2252
WW-31	L	West Wallsend Public School	49a Wallace St	Lot 5, Section J, DP 2252, Lot 6, Section J, DP 2252, Lot 7, Section J, DP 2252, Lot 8, Section J, DP 2252, Lot 9, Section J, DP 2252, Lot 10, Section J, DP 2252, Lot 11, Section J, DP 2252, Lot 12, Section J, DP 2252, Lot 1, DP 415746, Lot 1, DP 103681, Lot 1, DP 203314, Lot 1, DP 418805
WW-32	L	Miners' Memorial	49a Wallace St	Lot 8, Section J, DP 2252
WW-33	L	Presbyterian Church	48a Wallace St	Lot 1, Section O, DP 2253
WW-35	L	Baptist Church	49 Wallace St	Lot 15, Section K, DP 2252
WW-38	L	Former Northumberland Hotel	1 Hyndes St	Lot 11, DP 565278
WW-39	L	Cottage	53 Wilson St	Lot B, DP 315094
WW-40	L	Cottage	8 Laidley St	Lot B, DP 319636

WW-41	L	Museum Hotel	70 Wilson St	Lot 21, DP 700424
WW-46	L	Mt Sugarloaf and the Sugarloaf Range	Mt Sugarloaf Rd	Lot 1, DP 231108, Lot 2, DP 231108, Lot 21, DP 223395, Lot 1, DP 207238, Lot 1, DP 338999, Lot 121, DP 755262
WW-47	L	Mt Sugarloaf No 1 Colliery	Mt Sugarloaf Rd	Lot 7, DP 813135
WW-50	L	West Wallsend Cemetery	Cemetery Rd	Lots 980 and 981, DP 589701
WW-52	L	West Wallsend Valve House and Underground Reservoir	30a George Booth Dr, Estelville	Lot 1, DP 923587
WW-58	L	Anglican Church	11 Wallsend Rd	Lot 81, DP 1143907
Whitebridge				
WH-01	L	Whitebridge Cemetery	132a Dudley Rd	Lots 1697, 1698 and 1731, DP 755233
WH-02	L	House	105 Burwood Rd	Lot 7, DP 800730
WH-08	L	Railway Cutting and Bridge	Old Dudley Rd (also see RT-04)	
WH-09	L	Captain Bulls Garden	76 Bulls Garden Rd	Lot 10, DP 220823
Wyee				
WY-02	L	Wyee Channel	Extending north, from the Wyee Dam, passing under Summerhayes Rd	

Part 2 Potential archaeological sites other than of indigenous origins

Item No	Significance	Item	Address	Property description
1		Wharf	Middle Camp Beach, Catherine Hill Bay	
2		Wallarah East Pit	Flowers Dr, Catherine Hill Bay	
3		Newstan Colliery	Fassifern Rd, Fassifern	
4		Lambton Colliery Redhead	Crown Land Redhead	Lot 2050, DP 823153
5		Arnos Bros, Quarry	Teralba	
6		North Burwood Colliery	Burwood Rd, Whitebridge	
7	L	Former mine site	180 Ross St, Green Point Reserve	Lot 2, DP 845516
AW-08	L	Railway Station cottage	34 Brisbane St, Awaba	
BN-01	L	Former John Darling Colliery—potential archaeological site	John Fisher Rd, Siloam Dr, John Fallins Cl, John Darling Ave	Lots 2–8, DP 1038830 Lots 1–5, 7–9, 12–14 and 16 and 17, 19–20, 22 and 23–25, DP 270530 Lots 201–207, 209–221, 223, 225 and 226, DP 1136649 Lots 1 and 2, DP 1153652 Lots 301–330, DP 1148102 Lots 501–505, DP 1156100 Lots 1 and 2, DP 1159382

Schedule 5 Natural heritage items

(Dictionary)

Part 1 Items relating to fossils

Item No	Significance	Item	Address	Property description
Blackalls Park				
BK-01	L	Fossil Tree Sections	Venetia Ave	Lot 6, DP 12604
BK-04	L	Fossil Tree Reserve	40 Aldon Cr	Reserve 38237
Swansea Heads				
NI	L	Numerous fossil tree stumps preserved in situ—remains of fossil forest	Off Lambton Pde	Adjacent to Reserve 88033 and DP 39981
Tingira Heights				
TH-01	S L	Nature Reserve and being permian fossil insect horizon	Burton Rd	Lot 180, DP 755233 and area from Belmont to Warners Bay depicted on Map prepared by OLEM Knight, titled *Permian Fossil Horizon Belmont—Warners Bay* 1949 (Records of the Australian Museum 1950)

Part 2 Landmark of Aboriginal and European heritage significance supporting tree groups and individual trees

Item No	Significance	Item	Address	Property description
LM-01	L	Pulbah Island		

Schedule 6 Places or potential places of Aboriginal heritage significance

(Clause 50 and Dictionary)

Part 1 Places of Aboriginal heritage significance

Item No	Significance	Item	Address	Property description
	Various	All sites identified in the last edition of the National Parks and Wildlife Service's Aboriginal Sites Register available at the office of the Council		All property identified as an Aboriginal site in that Register

Part 2 Potential places of Aboriginal heritage significance

Item No	Significance	Item	Address	Property description
	Various	All sites, localities and landscapes identified in the *Lake Macquarie Aboriginal Heritage Study Report* available at the office of the Council		All properties identified as an Aboriginal site, locality or landscape as held in the records of Lake Macquarie City Council

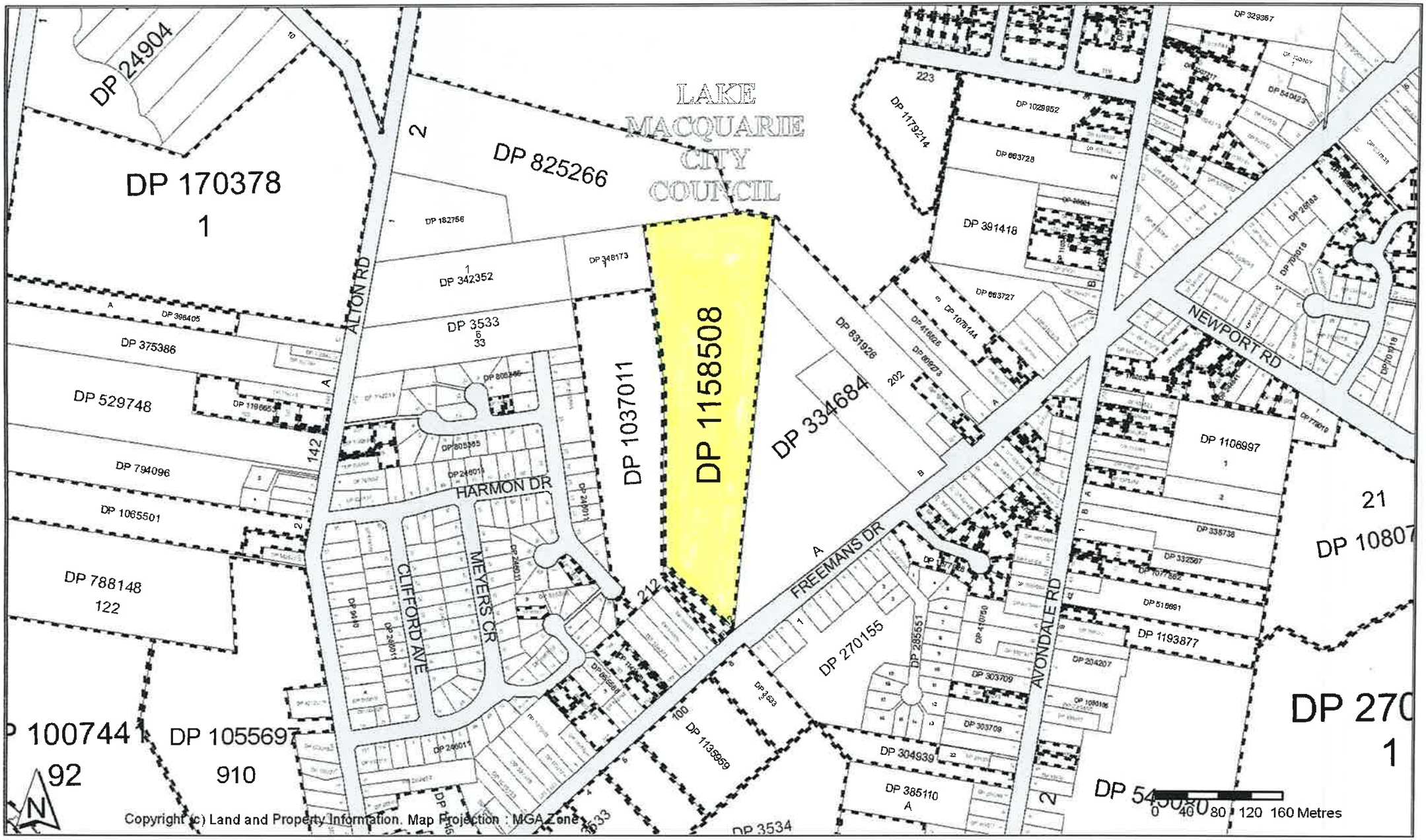
Land & Property Information
A division of the Department of Finance & Services

Cadastral Records Enquiry Report

Ref : 29

Requested Parcel : Lot 12 DP 1158508 **Identified Parcel** : Lot 12 DP 1158508

Locality : COORANBONG **LGA** : LAKE MACQUARIE **Parish** : COORUMBUNG **County** : NORTHUMBERLAND

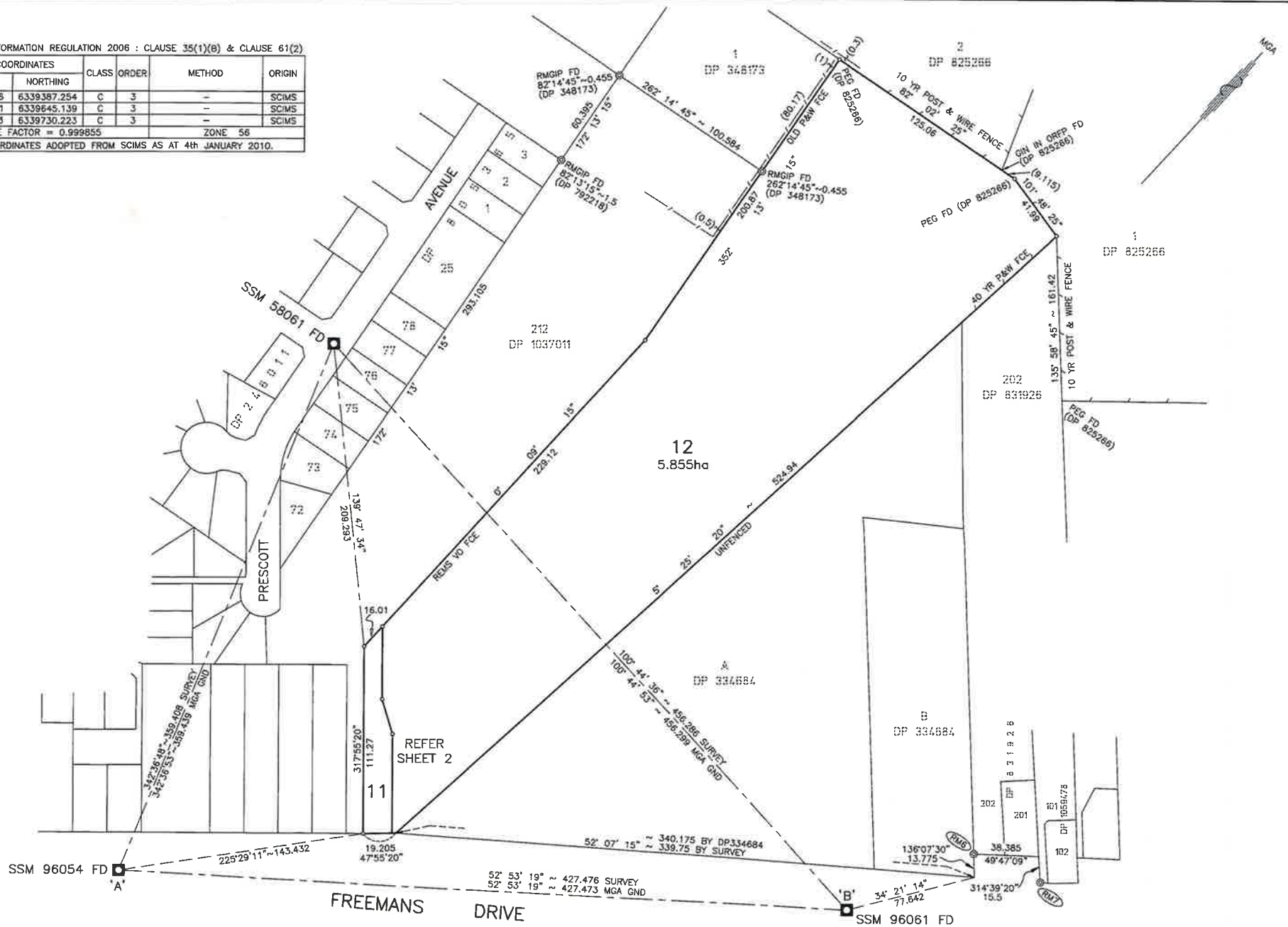


Report Generated 12:12:51 PM, 8 August, 2014

This information is provided as a searching aid only. While every endeavour is made to ensure the current cadastral pattern is accurately reflected, the Registrar General cannot guarantee the information provided. For all ACTIVITY PRIOR to SEPT 2002 you must refer to the RGs Charting and Reference Maps.

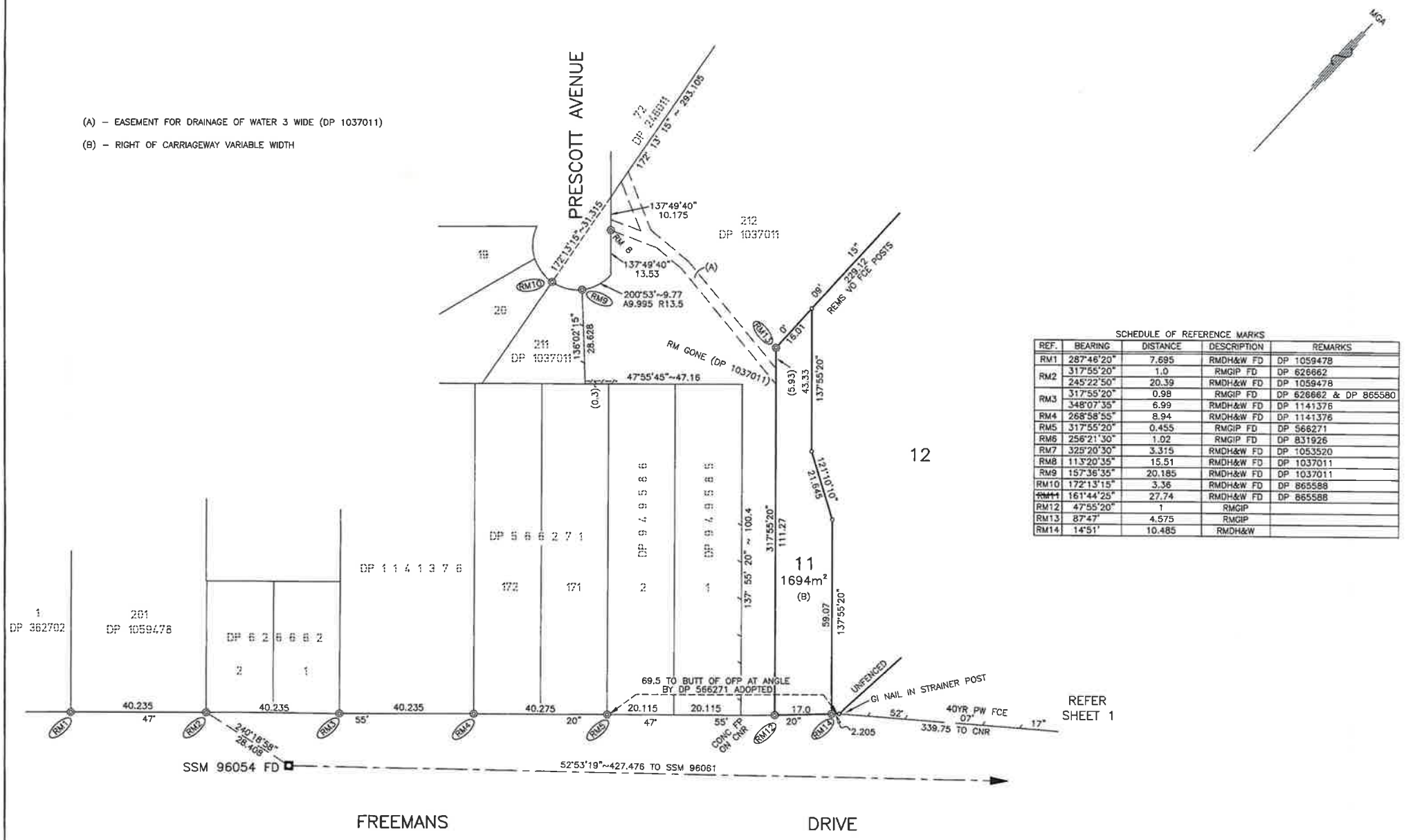
SURVEYING & SPACIAL INFORMATION REGULATION 2006 : CLAUSE 35(1)(B) & CLAUSE 61(2)

MARK	MGA COORDINATES		CLASS	ORDER	METHOD	ORIGIN
	EASTING	NORTHING				
SSM 96054	355972.826	6339387.254	C	3	–	SCIMS
SSM 96061	356313.671	6339645.139	C	3	–	SCIMS
SSM 58061	355865.443	6339730.223	C	3	–	SCIMS
COMBINED SCALE FACTOR = 0.999855					ZONE 56	
SOURCE : MGA COORDINATES ADOPTED FROM SCIMS AS AT 4th JANUARY 2010.						



Surveyor: DAVID CRAIG WALLACE Date of Survey: 4 JAN 2010 Surveyor's Ref: 07200DPD	PROPOSED PLAN OF ACQUISITION OF PART OF LOT 1 DP 120139	LGA: LAKE MACQUARIE Locality: COORANBONG Subdivision No: - Lengths are in metres. Reduction Ratio 1: 1500	Registered 12.11.2010	DP1158508 P

10 20 30 40 50 60 Table of mm 90 100 110 120 130 140



SCHEDULE OF REFERENCE MARKS

REF.	BEARING	DISTANCE	DESCRIPTION	REMARKS
RM1	287°46'20"	7.695	RMDH&W FD	DP 1059478
RM2	317°55'20"	1.0	RMGIP FD	DP 626662
	245°22'50"	20.39	RMDH&W FD	DP 1059478
RM3	317°55'20"	0.98	RMGIP FD	DP 626662 & DP 865580
	348°07'35"	6.99	RMDH&W FD	DP 1141376
RM4	268°58'55"	8.94	RMDH&W FD	DP 1141376
RM5	317°55'20"	0.455	RMGIP FD	DP 566271
RM6	256°21'30"	1.02	RMGIP FD	DP 831926
RM7	325°20'30"	3.315	RMDH&W FD	DP 1053520
RM8	113°20'35"	15.51	RMDH&W FD	DP 1037011
RM9	157°36'35"	20.185	RMDH&W FD	DP 1037011
RM10	172°13'15"	3.36	RMDH&W FD	DP 865588
~~RM11~~	161°44'25"	27.74	RMDH&W FD	DP 865588
RM12	47°55'20"	1	RMGIP	
RM13	87°47'	4.575	RMGIP	
RM14	14°51'	10.485	RMDH&W	

Surveyor: DAVID CRAIG WALLACE Date of Survey: 4 JAN 2010 Surveyor's Ref: 07200DPD	PROPOSED PLAN OF ACQUISITION OF PART OF LOT 1 DP 120139	LGA: LAKE MACQUARIE Locality: COORANBONG Subdivision No: - Lengths are in metres. Reduction Ratio 1: 750	Registered 12.11.2010	DP1158508

DEPOSITED PLAN ADMINISTRATION SHEET

Sheet 1 of 1 sheet(s)

SIGNATURES, SEALS and STATEMENTS of intention to dedicate public roads, to create public reserves, drainage reserves, easements, restrictions on the use of land or positive covenants.

It is intended to acquire Lot 11 for road purposes.

*

DP1158508 S

*

Registered: 12.11.2010

Title System: TORRENS

Purpose: ACQUISITION

* OFFICE USE ONLY

PROPOSED PLAN OF ACQUISITION OF PART OF LOT 1 DP 120139

LGA: Lake Macquarie

Locality: Cooranbong

Parish: Coorumbung

County: Northumberland

Use PLAN FORM 6A
for additional certificates, signatures, seals and statements

Crown Lands NSW/Western Lands Office Approval

I.....in approving this plan certify
(Authorised Officer)
that all necessary approvals in regard to the allocation of the land shown herein have been given

Signature:.....
Date:.....
File Number:.....
Office:.....

Subdivision Certificate

I certify that the provisions of s.109J of the Environmental Planning and Assessment Act 1979 have been satisfied in relation to:

the proposed..... set out herein
(insert 'subdivision' or 'new road')

.....
* Authorised Person/General Manager/Accredited Certifier

Consent Authority: .....
Date of Endorsement: .....
Accreditation no: .....
Subdivision Certificate no: .....
File no: .....

* Delete whichever is inapplicable.

Surveying and Spatial Information Regulation, 2006

I, David Craig Wallace of Monteath & Powys Pty Ltd, a surveyor registered under the *Surveying and Spatial Information Act, 2002*, certify that the survey represented in this plan is accurate, has been made in accordance with the *Surveying and Spatial Information Regulation, 2006* and was completed on: 4 January 2010.

The survey relates to Lots 11 and 12.
(specify the land actually surveyed or specify any land shown in the plan that is not the subject of the survey)

Signature .....*Dated:* 30-9-10
Surveyor registered under the Surveying and Spatial Information Act, 2002

Datum Line: 'A' – 'B'
Type: Urban/~~Rural~~

Plans used in the preparation of survey/compilation

DP 120139	DP 865588
DP 246011	DP 949585
DP 334684	DP 949586
DP 348173	DP 1037011
DP 566271	DP 1053520
DP 825266	DP 1059478
DP 831926	DP 1141376

(if insufficient space use Plan Form 6A annexure sheet)

SURVEYOR'S REFERENCE: 07200 DPD

LAND AND PROPERTY INFORMATION NEW SOUTH WALES - HISTORICAL SEARCH

SEARCH DATE
8/8/2014 1:26PM

FOLIO: 1/120139

First Title(s): OLD SYSTEM
Prior Title(s): VOL 7987 FOL 12

Recorded	Number	Type of Instrument	C.T. Issue
17/5/1989		CONVERTED TO COMPUTER FOLIO	FOLIO CREATED CT NOT ISSUED
12/11/2010	DP1158508	DEPOSITED PLAN	
~~4/5/2012~~	~~AG917792~~	~~TRANSFER~~ Transfer of Lot 11	FOLIO CANCELLED

*** END OF SEARCH ***

mg PRINTED ON 8/8/2014

**ANY ENTRIES PRECEDED BY AN ASTERISK DO NOT APPEAR ON THE CURRENT EDITION OF THE CERTIFICATE OF TITLE. WARNING: THE INFORMATION APPEARING UNDER NOTATIONS HAS NOT BEEN FORMALLY RECORDED IN THE REGISTER.*

Form: 01T
Release: 6·0

TRANSFER

New South Wales
Real Property Act 1900

AG917792W

PRIVACY NOTE: Section 31B of the Real Property Act 1900 (RP Act) authorises the Registrar General to collect the information required by this form for the establishment and maintenance of the Real Property Act Register. Section 96B RP Act requires that the Register is made available to any person for search upon payment of a fee, if any.

STAMP DUTY Office of State Revenue use only

NEW SOUTH WALES DUTY
06-01-2012 0006533270-001
SECTION 277-TRANSFER
NO DUTY PAYABLE

(A) **TORRENS TITLE** FI 1/120139: Part, being Lot 11 in DP 1158508

(B) **LODGED BY**

Document Collection Box	Name, Address or DX, Telephone, and Customer Account Number if any	CODES
BOX 582W	SERVICE FIRST REGISTRATION DX 189 SYDNEY LLPN123426A PH 9233 1314 FAX 9233 2878 Reference: LMCC-THOMSON	T TW

(C) **TRANSFEROR** Henry Daniel Millard Thomson

(D) **CONSIDERATION** The transferor acknowledges receipt of the consideration of $ 25,000.00 and as regards

(E) **ESTATE** the abovementioned land transfers to the transferee an estate in fee simple

(F) **SHARE TRANSFERRED**

(G) Encumbrances (if applicable):

(H) **TRANSFEREE** Council of the City of Lake Macquarie ABN 81 065 027 868

(I) **TENANCY:**

DATE 2ND APRIL, 2012

(J) I certify I am an eligible witness and that the transferor signed this dealing in my presence. [See note* below]

Signature of witness:

Name of witness: Bruce Dawson
Address of witness: Solicitor / Notary Public
45 Yambo Street, Morisset NSW 2264
4970 5555

Certified correct for the purposes of the Real Property Act 1900 by the transferor.

Signature of transferor:

Certified correct for the purposes of the Real Property Act 1900 on behalf of the transferee by the person whose signature appears below.

Signature:

Signatory's name: Grant W Long
Signatory's capacity: solicitor

(K) The transferee certifies that the eNOS data relevant to this dealing has been submitted and stored under eNOS ID No. 253132 Full name: JULIE V. PEARCE Signature:

* *s117 RP Act requires that you must have known the signatory for more than 12 months or have sighted identifying documentation.*

ALL HANDWRITING MUST BE IN BLOCK CAPITALS

LAND AND PROPERTY INFORMATION NEW SOUTH WALES - HISTORICAL SEARCH

SEARCH DATE
8/8/2014 1:27PM

FOLIO: 12/1158508

First Title(s): OLD SYSTEM
Prior Title(s): 1/120139

Recorded	Number	Type of Instrument	C.T. Issue
12/11/2010	DP1158508	DEPOSITED PLAN	LOT RECORDED FOLIO NOT CREATED
~~4/5/2012~~	~~AG917792~~	~~TRANSFER~~ Transfer held	FOLIO CREATED EDITION 1
21/6/2012	AG987275	TRANSFER GRANTING EASEMENT	EDITION 2
25/7/2013	AH901027	TRANSMISSION APPLICATION (EXECUTOR, ADMINISTRATOR, TRUSTEE)	EDITION 3
9/7/2014	AI723500	TRANSFER	EDITION 4

*** END OF SEARCH ***

mg PRINTED ON 8/8/2014

**ANY ENTRIES PRECEDED BY AN ASTERISK DO NOT APPEAR ON THE CURRENT EDITION OF THE CERTIFICATE OF TITLE. WARNING: THE INFORMATION APPEARING UNDER NOTATIONS HAS NOT BEEN FORMALLY RECORDED IN THE REGISTER.*

Form: 03AE
Release: 2·2

TRANSMISSION APPLICATION
by an Executor, Administrator or Trus
New South Wales
Section 93 Real Property Act 1900

AH901027D

PRIVACY NOTE: Section 31B of the Real Property Act 1900 (RP Act) authorises the Registrar General to collect the information required by this form for the establishment and maintenance of the Real Property Act Register. Section 96B RP Act requires that the Register is made available to any person for search upon payment of a fee, if any.

(A) **TORRENS TITLE** 12/1158508

(B) **REGISTERED DEALING**

NUMBER	TORRENS TITLE

(C) **LODGED BY**

DOCUMENT COLLECTION BOX	NAME, ADDRESS OR DX, TELEPHONE, AND CUSTOMER ACCOUNT NUMBER IF ANY	CODE
35D	LLPN: 123005 B MORRIS, HAYES & EDGAR DX 420 SYDNEY PH: 9232 241 AS AGENTS FOR REFERENCE: ICK7745 DAVELAAR	AE

(D) **DECEASED REGISTERED PROPRIETOR** Henry Daniel Millard THOMSON

(E) **APPLICANT** Barbara Joan WATSON and Peter Edmund THOMSON

(F) The abovementioned applicant, being entitled as executor of the will of the deceased registered proprietor (who died on 17 January 2013) pursuant to probate No. 2013/82655 granted on 18 June 2013 * (a certified copy of which is lodged herewith) hereby applies to be registered as proprietor of the estate or interest of the deceased registered proprietor in the abovementioned land

DATE 18 July 2013 * TO BARBARA JOAN WATSON AND PETER EDMUND THOMSON

(G)

Certified correct for the purposes of the Real Property Act 1900 on behalf of the applicant by the person whose signature appears below.

Signature:

Signatory's name: DEREK DAVELAAR
Signatory's capacity: solicitor

NOSI pble

(H) *This section is to be completed where a notice of sale is required and the relevant data has been forwarded through eNOS.*
The applicant certifies that the eNOS data relevant to this dealing has been submitted and stored under eNOS ID No. [ ] Full name: Signature:

** s117 RP Act requires that you must have known the signatory for more than 12 months or have sighted identifying documentation.*

ALL HANDWRITING MUST BE IN BLOCK CAPITALS.

Evidence sighted and returned (office use only):

1303

LAND AND PROPERTY INFORMATION NEW SOUTH WALES - TITLE SEARCH

FOLIO: 12/1158508

SEARCH DATE	TIME	EDITION NO	DATE
8/8/2014	1:27 PM	4	9/7/2014

LAND

LOT 12 IN DEPOSITED PLAN 1158508
AT COORANBONG
LOCAL GOVERNMENT AREA LAKE MACQUARIE
PARISH OF COORUMBUNG COUNTY OF NORTHUMBERLAND
TITLE DIAGRAM DP1158508

FIRST SCHEDULE

AUSTRALASIAN CONFERENCE ASSOCIATION LIMITED (T AI723500)

SECOND SCHEDULE (2 NOTIFICATIONS)

1 RESERVATIONS AND CONDITIONS IN THE CROWN GRANT(S)
2 AG987275 RIGHT OF CARRIAGEWAY APPURTENANT TO THE LAND ABOVE DESCRIBED AFFECTING THE WHOLE OF LOT 11 IN DP1158508

NOTATIONS

UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***

mg PRINTED ON 8/8/2014

APPENDIX C
ENGINEERING LOGS AND EXPLANATORY SHEETS

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TESTPIT LOG

CLIENT : Johnson Property Group Pty Ltd
PROJECT : Thompson Property Waste Water Treatment Facility
LOCATION : 617 Freemans Drive, Cooranbong

HOLE NO : TP001
PROJECT REF : CGS2276
SHEET : 1 OF 1

EQUIPMENT TYPE : 3.5t Excavator | METHOD : 450mm bucket
DATE EXCAVATED : 31/7/14 | LOGGED BY : IGP | CHECKED BY : PB
LOCATION : See Drawing for location

GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, plasticity or particle characteristic, colour Rock Type, grain size, colour Secondary and minor components	MOISTURE / WEATHERING	CONSISTENCY / REL DENSITY / ROCK STRENGTH	DYNAMIC PENETROMETER	HAND PENETRO-METER (kPa)	STRUCTURE & Other Observations
Not Encountered	0.30m ES-ES001 / QA001	0.0			TOSOIL, Silty SAND, fine grained, grey	M		2	100 200 300 400	
					0.15m Clayey SAND, fine grained, yellow-brown, low plasticity	M - W	L - MD	2 4 5		
		0.5			0.60m Sandy CLAY, medium plasticity, mottled red & yellow & brown, fine grained sand, trace silt	MC > PL	St	4 5 6 8		
		1.0			1.20m Sandy CLAY, medium plasticity, fine grained sand, mottled red & grey, trace silt	MC < PL	VSt	10 12		Some evidence of weathered rock structure observed at base of pit
		1.5			1.50m Testpit TP001 terminated at 1.50 m Target depth					
		2.0								

WATER / MOISTURE
D - Dry
M - Moist
W - Wet
OMC - Optimum MC
PL - Plastic Limit
▶— Water inflow

SAMPLES & FIELD TESTS
U - Undisturbed Sample
D - Disturbed Sample
ES - Environmental sample
B - Bulk Disturbed Sample
SPT - Standard Penetration Test
HP - Hand/Pocket Penetrometer

CONSISTENCY
VS - Very Soft
S - Soft
F - Firm
St - Stiff
VSt - Very Stiff
H - Hard

RELATIVE DENSITY
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

ROCK STRENGTH
EL - Extremely low
VL - Very low
L - Low
M - Medium
H - High
VH - Very high
EH - Extremely high

ROCK WEATHERING
RS - Residual soil
XW - Extremely weathered
DW - Distinctly weathered
SW - Slightly weathered
FR - Fresh rock

See Explanatory Notes for details of abbreviations & basis of descriptions.

CARDNO GEOTECH SOLUTIONS

TESTPIT LOG

CLIENT : Johnson Property Group Pty Ltd
PROJECT : Thompson Property Waste Water Treatment Facility
LOCATION : 617 Freemans Drive, Cooranbong

HOLE NO : TP002
PROJECT REF : CGS2276
SHEET : 1 OF 1

EQUIPMENT TYPE : 12/6/2014 | METHOD : 450mm bucket

DATE EXCAVATED : 31/7/14 | LOGGED BY : IGP | CHECKED BY : PB

LOCATION : See Drawing for location

GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, plasticity or particle characteristic, colour Rock Type, grain size, colour Secondary and minor components	MOISTURE / WEATHERING	CONSISTENCY / REL DENSITY / ROCK STRENGTH	DYNAMIC PENETROMETER	HAND PENETRO-METER (kPa)	STRUCTURE & Other Observations
Not Encountered	0.30m ES-ES002	0.0			TOPSOIL, Silty SAND, fine grained, grey			3	100 200 300 400	DCP at Surface (Blows/150): 3,3,2,2,6,6,6,6,8,12
					0.20m Clayey SAND, fine grained, yellow-brown, low plasticity		L - MD	3		
		0.5						2		
								2		
					0.70m Sandy CLAY, medium plasticity, mottled red & grey, fine grained sand, trace silt		St - VSt	6		
		1.0						6		
								6		
					1.20m Testpit TP002 terminated at 1.20 m Target depth					
		1.5								
		2.0								

WATER / MOISTURE
D - Dry
M - Moist
W - Wet
OMC - Optimum MC
PL - Plastic Limit
▶— Water inflow

SAMPLES & FIELD TESTS
U - Undisturbed Sample
D - Disturbed Sample
ES - Environmental sample
B - Bulk Disturbed Sample
SPT - Standard Penetration Test
HP - Hand/Pocket Penetrometer

CONSISTENCY
VS - Very Soft
S - Soft
F - Firm
St - Stiff
VSt - Very Stiff
H - Hard

RELATIVE DENSITY
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

ROCK STRENGTH
EL - Extremely low
VL - Very low
L - Low
M - Medium
H - High
VH - Very high
EH - Extremely high

ROCK WEATHERING
RS - Residual soil
XW - Extremely weathered
DW - Distinctly weathered
SW - Slightly weathered
FR - Fresh rock

See Explanatory Notes for details of abbreviations & basis of descriptions.

CARDNO GEOTECH SOLUTIONS

TESTPIT LOG

CLIENT : Johnson Property Group Pty Ltd
PROJECT : Thompson Property Waste Water Treatment Facility
LOCATION : 617 Freemans Drive, Cooranbong

HOLE NO : TP003
PROJECT REF : CGS2276
SHEET : 1 OF 1

EQUIPMENT TYPE : 12/6/2014 | METHOD : 450mm bucket

DATE EXCAVATED : 31/7/14 | LOGGED BY : IGP | CHECKED BY : PB

LOCATION : See Drawing for location

GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, plasticity or particle characteristic, colour Rock Type, grain size, colour Secondary and minor components	MOISTURE / WEATHERING	CONSISTENCY / REL DENSITY / ROCK STRENGTH	DYNAMIC PENETROMETER	HAND PENETRO-METER (kPa)	STRUCTURE & Other Observations
		0.0			TOPSOIL, Silty SAND, fine grained, grey	W		2		DCP at surface (blows/150): 2,2,4,5,4,5,6,8,10,12
					0.10m Clayey SAND / Sandy CLAY, low to medium plasticity, fine grained sand, yellow-brown			2		
	0.30m ES-ES003					M	L - MD	4		
Not Encountered		0.5			0.50m Silty Sandy CLAY, medium plasticity, grey-red, fine grained sand			5		
								4		
						MC > PL	St	5		
		1.0			1.20m			6		
					Testpit TP003 terminated at 1.20 m Target depth			8		
		1.5								
		2.0								

HAND PENETROMETER (kPa): 100, 200, 300, 400

WATER / MOISTURE
D - Dry
M - Moist
W - Wet
OMC - Optimum MC
PL - Plastic Limit
▶— Water inflow

SAMPLES & FIELD TESTS
U - Undisturbed Sample
D - Disturbed Sample
ES - Environmental sample
B - Bulk Disturbed Sample
SPT - Standard Penetration Test
HP - Hand/Pocket Penetrometer

CONSISTENCY
VS - Very Soft
S - Soft
F - Firm
St - Stiff
VSt - Very Stiff
H - Hard

RELATIVE DENSITY
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

ROCK STRENGTH
EL - Extremely low
VL - Very low
L - Low
M - Medium
H - High
VH - Very high
EH - Extremely high

ROCK WEATHERING
RS - Residual soil
XW - Extremely weathered
DW - Distinctly weathered
SW - Slightly weathered
FR - Fresh rock

See Explanatory Notes for details of abbreviations & basis of descriptions.

CARDNO GEOTECH SOLUTIONS

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Shaping the Future

Explanatory Notes

The methods of description and classification of soils and rocks used in this report are based on *Australian Standard 1726 Geotechnical Site Investigations Code.* Material descriptions are deduced from field observation or engineering examination, and may be appended or confirmed by in situ or laboratory testing. The information is dependent on the scope of investigation, the extent of sampling and testing, and the inherent variability of the conditions encountered.

Subsurface investigation may be conducted by one or a combination of the following methods.

Method	
Test Pitting: excavation/trench	
BH	Backhoe bucket
EX	Excavator bucket
X	Existing excavation
Natural Exposure: existing natural rock or soil exposure	
Manual drilling: hand operated tools	
HA	Hand Auger
Continuous sample drilling	
PT	Push tube
Hammer drilling	
AH	Air hammer
AT	Air track
Spiral flight auger drilling	
AS	Large diameter short spiral auger
AD/V	Continuous spiral flight auger: V-Bit
AD/T	Continuous spiral flight auger: TC-Bit
Rotary non-core drilling	
WS	Washbore (mud drilling)
RR	Rock roller
Rotary core drilling	
HQ	63mm diamond-tipped core barrel
NMLC	52mm diamond-tipped core barrel
NQ	47mm diamond-tipped core barrel
Concrete coring	
DT	Diatube

Sampling is conducted to facilitate further assessment of selected materials encountered.

Sampling method	
Disturbed sampling	
B	Bulk disturbed sample
D	Disturbed sample
ES	Environmental soil sample
Undisturbed sampling	
SPT	Standard Penetration Test sample
U#	Undisturbed tube sample (#mm diameter)
Water samples	
EW	Environmental water sample

Field testing may be conducted as a means of assessment of the in-situ conditions of materials encountered.

Field testing	
SPT	Standard Penetration Test (blows/150mm)
HP/PP	Hand/Pocket Penetrometer
Dynamic Penetrometers (blows/150mm)	
DCP	Dynamic Cone Penetrometer
PSP	Perth Sand Penetrometer
VS	Vane Shear
PBT	Plate Bearing Test

If encountered with SPT or dynamic penetrometer testing, refusal (R), virtual refusal (VR) or hammer bouncing (HB) may be noted.

The quality of the rock can be assessed be the degree of fracturing and the following.

Rock quality description	
TCR	Total Core Recovery (%) (length of core recovered divided by the length of core run)
RQD	Rock Quality Designation (%) (sum of axial lengths of core greater than 100mm long divided by the length of core run)

Notes on groundwater conditions encountered may include.

Groundwater	
Not Encountered	Excavation is dry in the short term
Not Observed	Groundwater observation not possible
Seepage	Groundwater seeping into hole
Inflow	Groundwater flowing/flooding into hole

Perched groundwater may result in a misleading indication of the depth to the true water table. Groundwater levels are likely to fluctuate with variations in climatic and site conditions.

Notes on the stability of excavations may include.

Excavation conditions	
Spalling	Material falling into excavation, may be described as minor or major spalling
Unstable	Collapse of the majority, or one or more face, of the excavation

Cardno Geotech Solutions

Shaping the Future

Explanatory Notes - General Soil Description

The methods of description and classification of soils used in this report are based on *Australian Standard 1726 Geotechnical Site Investigations Code.* In practice, if the material can be remoulded by hand in its field condition or in water it is described as a soil. The dominant soil constituent is given in capital letters, with secondary textures in lower case. In general, descriptions cover: soil type, strength / relative density, moisture, colour, plasticity and inclusions.

Soil types are described according to the dominant particle size on the basis of the following assessment.

Soil Classification		Particle Size
CLAY		< 0.002mm
SILT		0.002mm 0.075mm
SAND	*fine*	0.075mm to 0.2mm
	medium	0.2mm to 0.6mm
	coarse	0.6mm to 2.36mm
GRAVEL	*fine*	2.36mm to 6mm
	medium	6mm to 20mm
	coarse	20mm to 63mm
COBBLES		63mm to 200mm
BOULDERS		> 200mm

Soil types are qualified by the presence of minor components on the basis of field examination or grading.

Description	Percentage of minor component
Trace	< 5% in coarse grained soils
	< 15% in fine grained soils
With	5% to 12% in coarse grained soils
	15% to 30% in fine grained soils

The strength of cohesive soils is classified by engineering assessment or field/laboratory testing as follows.

Strength	Symbol	Undrained shear strength
Very Soft	VS	< 12kPa
Soft	S	12kPa to 25kPa
Firm	F	25kPa to 50kPa
Stiff	St	50kPa to 100kPa
Very Stiff	VSt	100kPa to 200kPa
Hard	H	> 200kPa

Cohesionless soils are classified on the basis of relative density as follows.

Relative Density	Symbol	Density Index
Very Loose	VL	< 15%
Loose	L	15% to 35%
Medium Dense	MD	35% to 65%
Dense	D	65% to 85%
Very Dense	VD	> 85%

The moisture condition of soil is described by appearance and feel and may be described in relation to the Plastic Limit (PL) or Optimum Moisture Content (OMC).

Moisture condition and description	
Dry	Cohesive soils; hard, friable, dry of plastic limit. Granular soils; cohesionless and free-running
Moist	Cool feel and darkened colour: Cohesive soils can be moulded. Granular soils tend to cohere
Wet	Cool feel and darkened colour: Cohesive soils usually weakened and free water forms when handling. Granular soils tend to cohere

The plasticity of cohesive soils is defined as follows.

Plasticity	Liquid Limit
Low plasticity	≤ 35%
Medium plasticity	> 35% ≤ 50%
High plasticity	> 50%

The structure of the soil may be described as follows.

Zoning	Description
Layer	Continuous across exposure or sample
Lens	Discontinuous layer (lenticular shape)
Pocket	Irregular inclusion of different material

The structure may include; defects such as softened zones, fissures, cracks, joints and root-holes; and coarse grained soils may be described as strongly or weakly cemented.

The soil origin may also be noted if possible to deduce.

Soil origin and description	
Fill	Man-made deposits or disturbed material
Topsoil	Material affected by roots and root fibres
Colluvial soil	Transported down slopes by gravity
Aeolian soil	Transported and deposited by wind
Alluvial soil	Deposited by rivers
Lacustrine soil	Deposited by lakes
Marine soil	Deposits in beaches, bays, estuaries
Residual soil	Developed on weathered rock

The origin of the soil generally cannot be deduced on the appearance of the material and may be assumed based on further geological evidence or field observation.

Cardno Geotech Solutions

Shaping the Future

Explanatory Notes - General Rock Description

The methods of description and classification of rocks used in this report are based on *Australian Standard 1726 Geotechnical Site Investigations Code.* In general, if a material cannot be remoulded by hand in its field condition or in water it is described as a rock, is classified by its geological terms. In general, descriptions cover: rock type, degree of weathering, strength, colour, grain size, structure and minor components or inclusions.

Sedimentary rock types are generally described according to the predominant grain size as follows.

Rock Type	Description
CONGLOMERATE	Rounded gravel sized fragments >2mm cemented in a finer matrix
SANDSTONE	Sand size particles defined by grain size and often cemented by other materials *fine* 0.06mm to 0.2mm *medium* 0.2mm to 0.6mm *coarse* 0.6mm to 2mm
SILTSTONE	Predominately silt sized particles
SHALE	Fine particles (silt or clay) and fissile
CLAYSTONE	Predominately clay sized particles

The classification of rock weathering is described based on definitions outlined in AS1726 as follows.

Term and symbol		Definition
Residual Soil	RS	Soil developed on extremely weathered rock; mass structure and substance are no longer evident
Extremely weathered	XW	Weathered to such an extent that it has 'soil' properties
Distinctly weathered	DW	Strength usually changed and may be highly discoloured. Porosity may be increased by leaching, or decreased due to deposition in pores
Slightly weathered	SW	Slightly discoloured; little/no change of strength from fresh rock
Fresh Rock	FR	Rock shows no sign of decomposition or staining

Rock material strength (distinct from mass strength which can be significantly weaker due to the effect of defects) can be defined based on the point load index as follows.

Term and symbol		Point Load Index I_s50
Extremely low	EL	< 0.03MPa
Very Low	VL	0.03MPa to 0.1MPa
Low	L	0.1MPa to 0.3MPa
Medium	M	0.3MPa to 1MPa
High	H	1MPa to 3MPa
Very High	VH	3MPa to 10MPa
Extremely High	EH	> 10MPa

For preliminary assessment and in cases where no point load testing is available, the rock strength may be assessed using the field guide specified by AS1726.

The defect spacing and bedding thickness of rocks, measured normal to defects of the same set or bedding, can be described as follows.

Definition	Defect Spacing
Thinly laminated	< 6mm
Laminated	6mm to 20mm
Very thinly bedded	20mm to 60mm
Thinly bedded	60mm to 0.2m
Medium bedded	0.2m to 0.6m
Thickly bedded	0.6m to 2m
Very thickly bedded	> 2m

Defects in rock mass are often described by the following.

Terms			
Joint	JT	Sheared zone	SZ
Bed Parting	BP	Sheared surface	SS
Contact	CO	Seam	SM
Dyke	DK	Crushed Seam	CS
Decomposed Zone	DZ	Infilled Seam	IS
Fracture	FC	Foliation	FL
Fracture Zone	FZ	Vein	VN

The shape and roughness of defects are described using the following terms.

Planarity		Roughness	
Planar	PR	Very Rough	VR
Curved	CU	Rough	RF
Undulating	U	Smooth	S
Irregular	IR	Polished	POL
Stepped	ST	Slickensides	SL

The coating or infill associated with defects can be described as follows.

Definition	Description
Clean	No visible coating or infilling
Stain	No visible coating or infilling; surfaces discoloured by mineral staining
Veneer	Visible coating or infilling of soil or mineral substance (<1mm). If discontinuous over the plane; patchy veneer
Coating	Visible coating or infilling of soil or mineral substance (>1mm)

Cardno Geotech Solutions

Shaping the Future

Graphics Symbols Index

CLAYS


CLAY


Silty CLAY


Sandy CLAY


Gravelly CLAY

SILTS


Organic SILT


SILT


Clayey SILT


Sandy SILT


Gravelly SILT

SANDS


SAND


Clayey SAND


Silty SAND


Gravelly SAND

GRAVELS


GRAVEL


Clayey GRAVEL


Silty GRAVEL


Sandy GRAVEL


COBBLES & BOULDERS

MISCELLANEOUS


FILL


TOPSOIL


CONCRETE


ASPHALT


CORE LOSS


PAVEMENT GRAVEL


PAVEMENT (Natural Gravels)


PAVEMENT (Crushed Rock)

SEDIMENTARY ROCK


CONGLOMERATE


BRECCIA


SANDSTONE


SILTSTONE


SHALE


MUDSTONE / CLAYSTONE


COAL

METAMORPHIC ROCK


SLATE / PHYLLITE / SCHIST


GNEISS


QUARTZITE

IGNEOUS ROCK


GRANITE


BASALT


TUFF

APPENDIX D
LABORATORY RESULTS

Cardno Geotech Solutions
Shaping the Future

CERTIFICATE OF ANALYSIS

Work Order	: **ES1416869**	Page	: 1 of 7
Client	: **CARDNO GEOTECH SOLUTIONS**	Laboratory	: Environmental Division Sydney
Contact	: MR IAN PIPER	Contact	: Client Services
Address	: PO BOX 4224 BERESFORD NSW, AUSTRALIA 2322	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: ian.piper@cardno.com.au	E-mail	: sydney@alsglobal.com
Telephone	: +61 02 4949 4300	Telephone	: +61-2-8784 8555
Facsimile	: +61 02 4966 0485	Facsimile	: +61-2-8784 8500
Project	: CGS2276	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 01-AUG-2014
Sampler	: GM	Issue Date	: 06-AUG-2014
Site	: ----		
		No. of samples received	: 4
Quote number	: EN/024/14	No. of samples analysed	: 4

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics
Pabi Subba	Senior Organic Chemist	Sydney Organics
Shobhna Chandra	Metals Coordinator	Sydney Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	ES001	ES002	ES003	QA1	----
				Client sampling date / time	31-JUL-2014 15:00	31-JUL-2014 15:00	31-JUL-2014 15:00	31-JUL-2014 15:00	----
Compound	CAS Number	LOR	Unit		ES1416869-001	ES1416869-002	ES1416869-003	ES1416869-004	----
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1.0	%		14.8	15.7	19.0	14.9	----
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	<5	<5	<5	----
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	----
Chromium	7440-47-3	2	mg/kg		5	11	8	5	----
Copper	7440-50-8	5	mg/kg		<5	<5	9	<5	----
Lead	7439-92-1	5	mg/kg		5	7	28	5	----
Nickel	7440-02-0	2	mg/kg		<2	<2	<2	<2	----
Zinc	7440-66-6	5	mg/kg		10	<5	133	10	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	----
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	----
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----
beta-BHC	319-85-7	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----
gamma-BHC	58-89-9	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----
delta-BHC	319-86-8	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----
Heptachlor	76-44-8	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----
Aldrin	309-00-2	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----
^ Total Chlordane (sum)	----	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----
trans-Chlordane	5103-74-2	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----
alpha-Endosulfan	959-98-8	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----
cis-Chlordane	5103-71-9	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----
Dieldrin	60-57-1	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----
4.4`-DDE	72-55-9	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----
Endrin	72-20-8	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----
beta-Endosulfan	33213-65-9	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----
4.4`-DDD	72-54-8	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----
Endrin aldehyde	7421-93-4	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	ES001	ES002	ES003	QA1	----
				Client sampling date / time	31-JUL-2014 15:00	31-JUL-2014 15:00	31-JUL-2014 15:00	31-JUL-2014 15:00	----
Compound	CAS Number	LOR	Unit		ES1416869-001	ES1416869-002	ES1416869-003	ES1416869-004	----
EP068A: Organochlorine Pesticides (OC) - Continued									
4.4`-DDT	50-29-3	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	----
Endrin ketone	53494-70-5	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----
Methoxychlor	72-43-5	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----
^ Sum of DDD + DDE + DDT	----	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----
EP068B: Organophosphorus Pesticides (OP)									
Dichlorvos	62-73-7	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----
Demeton-S-methyl	919-86-8	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----
Monocrotophos	6923-22-4	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	----
Dimethoate	60-51-5	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----
Diazinon	333-41-5	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----
Parathion-methyl	298-00-0	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	----
Malathion	121-75-5	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----
Fenthion	55-38-9	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----
Chlorpyrifos	2921-88-2	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----
Parathion	56-38-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	----
Pirimphos-ethyl	23505-41-1	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----
Bromophos-ethyl	4824-78-6	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----
Fenamiphos	22224-92-6	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----
Prothiofos	34643-46-4	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----
Ethion	563-12-2	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----
Carbophenothion	786-19-6	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----
Azinphos Methyl	86-50-0	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Fluorene	86-73-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Anthracene	120-12-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Pyrene	129-00-0	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	ES001	ES002	ES003	QA1	----
				Client sampling date / time	31-JUL-2014 15:00	31-JUL-2014 15:00	31-JUL-2014 15:00	31-JUL-2014 15:00	----
Compound	CAS Number	LOR	Unit		ES1416869-001	ES1416869-002	ES1416869-003	ES1416869-004	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Chrysene	218-01-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		**0.6**	**0.6**	**0.6**	**0.6**	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		**1.2**	**1.2**	**1.2**	**1.2**	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	<10	----
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	<50	----
C15 - C28 Fraction	----	100	mg/kg		<100	<100	<100	<100	----
C29 - C36 Fraction	----	100	mg/kg		<100	<100	<100	<100	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	<50	<50	<50	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	<10	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	----
>C10 - C16 Fraction	>C10_C16	50	mg/kg		<50	<50	<50	<50	----
>C16 - C34 Fraction	----	100	mg/kg		<100	<100	<100	<100	----
>C34 - C40 Fraction	----	100	mg/kg		<100	<100	<100	<100	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		<50	<50	<50	<50	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	<50	<50	<50	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	----
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	ES001	ES002	ES003	QA1	----
				Client sampling date / time	31-JUL-2014 15:00	31-JUL-2014 15:00	31-JUL-2014 15:00	31-JUL-2014 15:00	----
Compound	CAS Number	LOR	Unit		ES1416869-001	ES1416869-002	ES1416869-003	ES1416869-004	----
EP080: BTEXN - Continued									
^ **Total Xylenes**	1330-20-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	----
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		**115**	**99.8**	**96.7**	**100**	----
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.1	%		**85.4**	**87.5**	**82.9**	**88.4**	----
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.1	%		**93.1**	**95.8**	**90.0**	**98.2**	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.1	%		**89.0**	**85.1**	**89.6**	**93.0**	----
2-Chlorophenol-D4	93951-73-6	0.1	%		**92.0**	**88.3**	**93.4**	**95.7**	----
2.4.6-Tribromophenol	118-79-6	0.1	%		**69.5**	**71.4**	**74.6**	**75.3**	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		**93.0**	**87.3**	**91.9**	**93.9**	----
Anthracene-d10	1719-06-8	0.1	%		**104**	**101**	**104**	**107**	----
4-Terphenyl-d14	1718-51-0	0.1	%		**93.9**	**89.3**	**94.3**	**96.3**	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**98.9**	**89.7**	**93.0**	**103**	----
Toluene-D8	2037-26-5	0.1	%		**109**	**97.3**	**95.5**	**99.8**	----
4-Bromofluorobenzene	460-00-4	0.1	%		**112**	**97.9**	**99.6**	**106**	----

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	CAS Number	Recovery Limits (%) Low	High
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	39	149
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	49	147
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	35	143
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	63	123
2-Chlorophenol-D4	93951-73-6	66	122
2.4.6-Tribromophenol	118-79-6	40	138
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	70	122
Anthracene-d10	1719-06-8	66	128
4-Terphenyl-d14	1718-51-0	65	129
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	72.8	133.2
Toluene-D8	2037-26-5	73.9	132.1
4-Bromofluorobenzene	460-00-4	71.6	130.0

Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EN1402611**	Page	: 1 of 3
Client	: **CARDNO GEOTECH SOLUTIONS**	Laboratory	: Environmental Division Newcastle
Contact	: MR IAN PIPER	Contact	: Peter Keyte
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Facsimile	: +61 02 4966 0485	Facsimile	: +61-2-4968 0349
Project	: CGS2276	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 01-AUG-2014
Sampler	: GM	Issue Date	: 06-AUG-2014
Site	: ----		
		No. of samples received	: 4
Quote number	: EN/024/14	No. of samples analysed	: 4

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Descriptive Results

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

WORLD RECOGNISED ACCREDITATION

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Gerrad Morgan	Asbestos Identifier	Newcastle - Asbestos

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **EA200 Legend**
- **EA200 'Am' Amosite (brown asbestos)**
- **EA200 'Ch' Chrysotile (white asbestos)**
- **EA200 'Cr' Crocidolite (blue asbestos)**
- **EA200 'Trace' - Asbestos fibres ("Free Fibres") detected by trace analysis per AS4964. The result can be interpreted that the sample contains detectable 'respirable' asbestos fibres**
- **EA200: 'UMF' Unknown Mineral Fibres. "-" indicates fibres detected may or may not be asbestos fibres. Confirmation by alternative techniques is recommended.**
- **EA200: Asbestos Identification Samples were analysed by Polarised Light Microscopy including dispersion staining.**
- **EA200: Negative results for vinyl tiles should be confirmed by an independent analytical technique.**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	ES001	ES002	ES003	QA1	----
				Client sampling date / time	31-JUL-2014 15:00	31-JUL-2014 15:00	31-JUL-2014 15:00	31-JUL-2014 15:00	----
Compound	CAS Number	LOR	Unit		EN1402611-001	EN1402611-002	EN1402611-003	EN1402611-004	----
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples									
Asbestos Detected	1332-21-4	0.1	g/kg		**No**	**No**	**No**	**No**	----
Asbestos Type	1332-21-4	-	--		**-**	**-**	**-**	**-**	----
Sample weight (dry)	----	0.01	g		**114**	**319**	**333**	**203**	----
APPROVED IDENTIFIER:	----	-	--		**G.MORGAN**	**G.MORGAN**	**G.MORGAN**	**G.MORGAN**	----

Analytical Results

Descriptive Results

Sub-Matrix: **SOIL**

Method: Compound	Client sample ID - Client sampling date / time	Analytical Results
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples		
EA200: Description	ES001 - 31-JUL-2014 15:00	Mid brown clay soil with some vegetation.
EA200: Description	ES002 - 31-JUL-2014 15:00	Mid brown clay soil with some vegetation.
EA200: Description	ES003 - 31-JUL-2014 15:00	Mid brown clay soil with some vegetation.
EA200: Description	QA1 - 31-JUL-2014 15:00	Mid brown clay soil with some vegetation.

Appendix 8

Concept Stormwater Management Strategy

NORTHROP

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PO Box 180 Charlestown NSW 2290
T (02) 4943 1777 F (02) 4943 1577
E newcastle@northrop.com.au

NL140143_B01

6th June 2014

RPS Australia Asia Pacific Pty Ltd
Mr Robert Dwyer
241 Denison Street
Broadmeadow NSW 2292

Dear Robert,

Re: Cooranbong Local Water Centre – Concept Stormwater Management Strategy

Northrop Consulting Engineers have been engaged by RPS Australia Asia Pacific Pty Ltd to provide the concept stormwater management strategy for the proposed Cooranbong Local Water Centre (LWC), to be utilised for the North Cooranbong Residential Precinct Urban Release Area.

This letter should be read in conjunction with the attached Concept Stormwater Management Plans NL140143/CSK1-CSK2.

Site Appreciation

The Coorangbong LWC is to be located on a portion of Lot 12 DP 1158508, herein known as "the site". It is anticipated the lot will be subdivided in the near future to accommodate the LWC in a separate allotment, along with additional residential lots for the greater North Cooranbong Residential Precinct. Some key features of the future allotment are;

- The allotment area is approximately 1.0ha;
- The LWC building occupies an area of approximately 600m^2;
- The external hardstand occupies an area of approximately 1500m^2;
- The external plant and equipment (e.g., tanks) occupies an area of approximately 1600m^2;
- Significant areas for soft landscaping have been provided in and around the facility; and
- The site is proposed to have permanent vehicle access from a future road created through the subdivision process associated with the North Cooranbong land release. A fire trail access will also be provided.

A schematic of the site is shown overleaf in Figure 1.

Prepared	AK	06/06/2014
Reviewed	AB	06/06/2014

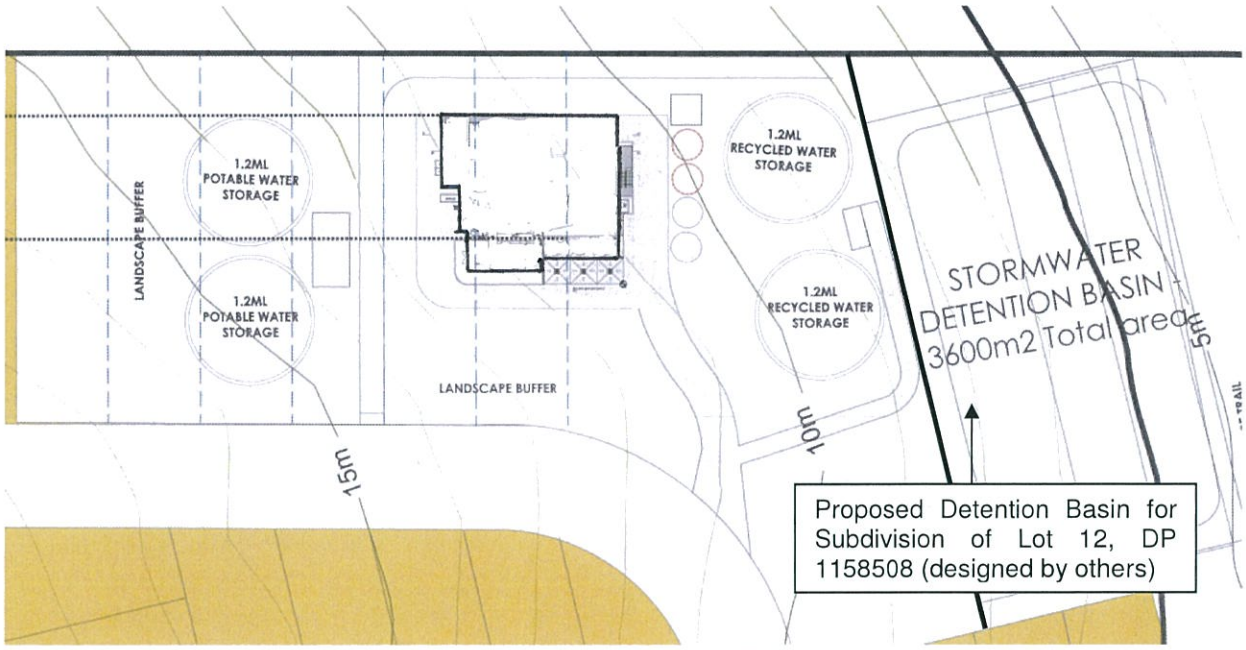

Figure 1 – Site Schematic

We understand ADW Johnson are undertaking the design and documentation of the stormwater management strategy for subdivision of Lot 12 DP 1158508. The design is taking into account the proposed layout of the LWC, along with the additional residential lots, as outlined in the Statement of Environmental Effects, prepared by Johnson Property Group (dated May 2014, submitted to Council under DA-714/2014). The management strategy is summarised below;

- An above ground detention basin will be implemented to achieve Councils detention requirements; and
- A Gross Pollutant Trap (GPT) and swales will be implemented to achieve Councils water quality requirements.

Construction Phase Soil and Water Management

As part of the Stormwater Management investigation, a Concept Soil and Water Management Plan has been compiled in accordance with Landcom Managing Urban Stormwater – Soils and Construction (the Blue Book). A range of control measures to eliminate, limit or mitigate impacts from construction activities have been proposed. Some of these control measures include:

- Diversion swales up slope of the proposed disturbance areas;
- Coir logs at 15m centres within the proposed drainage swales;
- Sediment fences downslope of all disturbed areas and material stockpile areas;
- Sediment basin providing a minimum of 105m^3 of storage volume; and
- Re-vegetation of disturbed areas post construction.

The proposed Concept Soil and Water Management Plan can be seen in the attached drawing NL140143/CSK1.

Stormwater Management – Water Quantity and Quality

The subdivision of Lot 12 DP 1158508 will be designed to achieve Councils water quantity and quality targets as outlined in the Statement of Environmental Effects, provided by Johnson Property Group (Council Ref# DA-714/2014). As such, no formal quantitative treatment should be

required from the Cooranbong LWC site. We reiterate that the regional stormwater management strategy, to be prepared by ADW Johnson, is taking into account the proposed LWC layout.

Notwithstanding this, a Concept Stormwater Management Plan has been prepared to further manage stormwater runoff from the LWC. This concept plan incorporates a range of water sensitive and industry best practice management measures with the endeavour of further improving water quality onsite whilst harnessing the synergy of providing water quality treatment, flow retention and passive irrigation. No onsite detention is required or proposed for the LWC, although the proposed site management strategy will provide additional flow retention over and above that required. The proposed Concept Stormwater Management Plan can be seen in the attached drawing NL140143/CSK2.

Furthermore, vehicle loading areas or areas where potential spillage could occur will be isolated and additional treatment measures will be employed. For example: the inclusion of physical bunds in hazard areas; the inclusion of spill containment and storage systems; as well as developing operational procedures to control handling and minimise the likelihood for spillage whilst also managing spill response. Such systems will be incorporated in to the detailed design to reflect the sites handling and operational procedures.

Conclusions

The proposed Concept Stormwater Management Strategy for the site has been prepared in line with the overarching stormwater management strategy for Lot 12 DP 1158508 and industry best practice.

The Soil and Water Management Plan and Concept Stormwater Management Plan provide adequate treatment of runoff from both construction and ongoing operations for the proposed Cooranbong Local Water Centre.

I trust the above meets your requirements, however, if you would like to discuss further then please do not hesitate to contact the undersigned on 4943 1777.

Yours sincerely,

Aaron Knight
Civil Engineer
BE (Civil Hons 1)

ATTACHMENT A – ENGINEERING DRAWINGS

PROVIDE CLEAN WATER DIVERSION SWALE UPSLOPE OF SOIL DISTURBANCE ACTIVITIES

PROVIDE EARTHERN MOUND TO DISPERSE RUNOFF

TEMPORARILY DIVERT CAPTURED RUNOFF

PROVIDE COIR LOGS WITHIN DRAINAGE SWALES DURING CONSTRUCTION

PROVIDE SEDIMENT CONTROL FENCE DOWNSLOPE OF SOIL DISTURBANCE ACTIVIES AND BUILDING PAD

SOIL & WATER MANAGEMENT NOTES

1. ALL WORK IS TO BE CARRIED OUT IN ACCORDANCE WITH RELEVANT ORDINANCES AND REGULATIONS, NOTE IN PARTICULAR THE REQUIREMENTS OF LANDCOMS MANAGING URBAN STORMWATER, SOILS AND CONSTRUCTION' (THE 'BLUE BOOK').
2. INSTALL SEDIMENT PROTECTION FILTERS ON ALL NEW AND EXISTING STORMWATER INLET PITS IN ACCORDANCE WITH EITHER THE MESH AND GRAVEL INLET FILTER DETAIL SD6-11 OR THE GEOTEXTILE INLET FILTER DETAIL SD6-12 OF THE 'BLUE BOOK'.
3. ESTABLISH ALL REQUIRED SEDIMENT FENCES IN ACCORDANCE WITH DETAIL SD6-8 OF THE 'BLUE BOOK'.
4. INSTALL SEDIMENT FENCING AROUND INDIVIDUAL BUILDING ZONES/AREAS AS REQUIRED AND AS DIRECTED BY THE SUPERINTENDENT.
5. ALL TRENCHES INCLUDING ALL SERVICE TRENCHES AND SWALE EXCAVATION SHALL BE SIDE-CAST TO THE HIGH SIDE AND CLOSED AT THE END OF EACH DAYS WORK.
6. THE CONTRACTOR SHALL ENSURE THAT ALL VEGETATION (TREE, SHRUB & GROUND COVER) WHICH IS TO BE RETAINED SHALL BE PROTECTED DURING THE DURATION OF CONSTRUCTION. REFER ARCHITECTS PLANS FOR TREES TO BE KEPT.
7. ALL VEGETATION TO BE REMOVED SHALL BE MULCHED ONSITE AND SPREAD/STOCKPILED AS DIRECTED BY THE SUPERINTENDENT.
8. STRIP TOPSOIL IN AREAS DESIGNATED FOR STRIPPING AND STOCKPILE FOR RE-USE AS REQUIRED. ANY SURPLUS MATERIAL SHALL BE REMOVED FROM SITE AND DISPOSED OF IN ACCORDANCE WITH EPA GUIDELINES.
9. CONSTRUCT AND MAINTAIN ALL MATERIAL STOCKPILES IN ACCORDANCE WITH DETAIL SD4-1 OF THE 'BLUE BOOK' (INCLUDING CUT-OFF SWALES TO THE HIGH SIDE AND SEDIMENT FENCES TO THE LOW SIDE).
10. ENSURE STOCKPILES DO NOT EXCEED 2.0m HIGH. PROVIDE WIND AND RAIN EROSION PROTECTION AS REQUIRED IN ACCORDANCE WITH THE 'BLUE BOOK'.
11. PROVIDE WATER TRUCKS OR SPRINKLER DEVICES DURING CONSTRUCTION AS REQUIRED TO SUPPRESS DUST.
12. ONCE CUT/FILL OPERATIONS HAVE BEEN FINALIZED ALL DISTURBED AREAS THAT ARE NOT BEING WORKED ON SHALL BE RE-VEGETATED AS SOON AS IS PRACTICAL.
13. THE CONTRACTOR SHALL BE RESPONSIBLE FOR KEEPING A DETAILED WRITTEN RECORD OF ALL EROSION & SEDIMENT CONTROLS ON-SITE DURING THE CONSTRUCTION PERIOD. THIS RECORD SHALL BE UPDATED ON A DAILY BASIS & SHALL CONTAIN DETAILS ON THE CONDITION OF CONTROLS AND ANY/ ALL MAINTENANCE, CLEANING & BREACHES. THIS RECORD SHALL BE KEPT ON-SITE AT ALL TIMES AND SHALL BE MADE AVAILABLE FOR INSPECTION BY THE PRINCIPAL CERTIFYING AUTHORITY AND THE SUPERINTENDENT DURING NORMAL WORKING HOURS.
14. WATER CAPTURED WITHIN THE SEDIMENT BASIN DURING CONSTRUCTION SHALL BE FLOCCULATED AND SETTLED BEFORE DISCHARGING TO THE ADJACENT DETENTION BASIN AS SHOWN ON PLAN. THE DISCHARGE OF WATER SHALL OCCUR ONLY WHEN THE SUSPENDED SOLIDS (SS) CONCENTRATION DROPS BELOW 50mg/L. TESTING OF SS CONCENTRATION SHALL BE UNDERTAKEN PRIOR TO DISCHARGE WITH DISCHARGE AND TESTING BEING CONDUCTED IN ACCORDANCE WITH APPENDIX E OF THE 'BLUE BOOK'. PROVIDE PUMPING EQUIPMENT TO DISCHARGE WATER AS NECESSARY.

4m FIRE TRAIL

LANDSCAPE BUFFER

1.2ML POTABLE WATER STORAGE

1.2ML POTABLE WATER STORAGE

Local Water Centre

DRINKING WATER COMPOUND 10m x 8m

INTERIM FLOW BALANCE TANKS

1.2ML RECYCLED WATER STORAGE

1.2ML RECYCLED WATER STORAGE

RECYCLED WATER COMPOUND 6m x 8m

4m FIRE TRAIL

LANDSCAPE BUFFER

15m

10m

LANDSCAPE/BUFFER

STORMWATER DETENTION BASIN - 3600m2 Total area

1:100 FLOOD LEVEL

PROPOSED SEDIMENT BASIN TO PROVIDE A MINIMUM OF 105m3 OF STORAGE VOLUME. DETAILS TO BE PROVIDED AT CC STAGE.

NOT FOR CONSTRUCTION

VERIFIER: A.Brown
JOB MANAGER: A.Brown
DESIGNED: A.Knight
DRAWN: A.Knight

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR INFORMATION	AK	AB	AK	22.05.14
2	RE-ISSUED FOR INFORMATION	AK	AB	AK	29.05.14
A	ISSUED FOR APPROVAL	AK	AB	AK	06.06.14

CLIENT: RPS AUSTRALIA ASIA PACIFIC

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ARCHITECT: PERMEATE PARTNERS

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SCALE 1:500 @ A3

NORTHROP
Newcastle
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Ph (02) 4943 1777 Fax (02) 4943 1577
Email newcastle@northrop.com.au ABN 81 094 433 100

PROJECT: COORANBONG PARK LOCAL WATER CENTRE

DRAWING TITLE: CONCEPT SOIL AND WATER MANAGEMENT PLAN

JOB NUMBER: NL140143

DRAWING NUMBER: CSK1

REVISION: A

DRAWING SHEET SIZE = A3

DENOTES PROPOSED DIRECTION OF FALL IN FINISHED SURFACE

Provide Earthern Mound to Disperse Runoff Across the Site Boundary to the Adjacent Vegetation Corridor

Provide Diversion Swale Upstream of Site Infrastructure

Max 2m Retaining Wall

Connect Drainage Swale to Proposed Detention Basin. Provide Erosion Protection as Required. Details to be Provided at CC Stage.

RL 11.00

4m FIRE TRAIL

RL 11.15

Local Water Centre

RL 11.35

RL 13.00

RL 11.25

RL 11.30

PAD RL = 13.10

FFL = 13.10

LANDSCAPE BUFFER

PAD RL = 13.10

4m FIRE TRAIL

Ramp @ 7% Max

LANDSCAPE BUFFER

Batter at Max 1:3

EX RL 51.50

Max 1.2m Retaining Wall

15m

PAD RL = 8.30

RL 8.20

Infrastructure To Be Confirmed

PAD RL = 8.30

10m

Ramp @ 10% Max

Proposed Culvert

EX RL 11.00

STORMWATER DETENTION BASIN - 3600m2 Total area

1:100 FLOOD LEVEL

Connect Drainage Swale to Proposed Detention Basin. Provide Erosion Protection as Required. Details to be Provided at CC Stage.

DRAWN A.Knight
DESIGNED A.Knight
JOB MANAGER A.Brown
VERIFIER A.Brown

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR INFORMATION	AK	AB	AK	22.05.14
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PROJECT: COORANBONG LOCAL WATER CENTRE

DRAWING TITLE: CONCEPT STORMWATER MANAGEMENT PLAN

JOB NUMBER: NL140143

DRAWING NUMBER: CSK2

REVISION: A

DRAWING SHEET SIZE = A1

Appendix 9

Soil and Water Impact Assessment

Whitehead & Associates
Environmental Consultants
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Email mail@whiteheadenvironmental.com.au

Soil and Water Impact Assessment for Proposed Local Water Centre, Cooranbong

Prepared for	RPS Australia
Prepared by	Zoe Rogers and Strider Deurinckx Whitehead & Associates Environmental Consultants Pty Ltd 197 Main Road CARDIFF NSW 2285
Telephone: Fax: email:	02 4954 4996 02 4954 4996 zoerogers@whiteheadenvironmental.com.au

Document Control Sheet

Document and Project Details					
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Author:	Zoe Rogers				
Project Manager:	Strider Deurinckx				
Date of Issue:	14 August 2014				
Job Reference:	Report_1303_001				
Synopsis:	This report provides an assessment of the potential impacts on soil and water quality arising from the construction and operation of a proposed water recycling facility at 617 Freemans Drive, Cooranbong (Lot 12 DP 1158508).				
Client Details					
Client:	RPS Australia				
Primary Contact:	Rob Dwyer				
Document Distribution					
Version Number	**Date**	**Status**	**DISTRIBUTION – NUMBER OF COPIES** (p – print copy; e – electronic copy)		
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02	15/08/14	FINAL	1e		
Document Verification					
Checked by: Strider Duerinckx			***Issued by:*** Zoe Rogers		

Disclaimer

The information contained in this report is based on independent research undertaken by Zoe Rogers of Whitehead & Associates Environmental Consultants Pty Ltd (W&A). To my knowledge, it does not contain any false, misleading or incomplete information. Recommendations are based on an appraisal of the site conditions subject to the limited scope and resources available for this project, and follow relevant industry standards. The work performed by W&A included a desktop review of limited information only, and the conclusions made in this report are based on the information gained and the assumptions as outlined, including results of studies by third parties. W&A make no assurances about the relevance or accuracy of any third-party information sources. Under no circumstances, can it be considered that these results represent the actual state of the Site at all points as subsurface conditions are inherently variable. Concentrations of contaminants may also change with time, and the conclusions in this report have a limited lifespan.

Copyright Note

Table of Contents

1 Introduction

1.1 Purpose of This Report

This report provides an assessment of the potential impacts on soil and surface waters that could result from the construction and operation of the proposed Local Water Centre (LWC) at 617 Freemans Drive, Cooranbong (Lot 12 DP 1158508) ("the Site"). The LWC is also known as the Cooranbong Local Water Centre ("Cooranbong LWC" or LWC) and will be constructed, operated and maintained by Cooranbong Water, a subsidiary of Flow Systems Pty Ltd ("Flow Systems").

This report forms part of an Environmental Impact Statement (EIS) prepared for the LWC, and refers to the Secretary's Environmental Assessment Requirements (SEARs) issued by the Department of Planning and Environment on 16 May 2014. Specifically, this report addresses the following 'Key Issue' listed in the SEARs:

> **Soil and water quality** – detail the potential occurrence of contaminated soils and likely impacts from the disturbance of those soils, including impacts on water quality. This must include an assessment of contamination resulting from the proposal. The assessment must detail what the potential for contamination will be and the water quality expected to be outputted by the facility.

'The proposal' as described above is defined as the construction and operation of the proposed LWC at the Site. The potential impacts are only those that could occur on the Site around the LWC, and not within the plant itself. In addressing the potential soil and water quality impacts, W&A have relied entirely on information provided to us by third parties, including (but not limited to):

- Review of Environmental Factors for the Cooranbong Local Water Centre, Cooranbong, New South Wales, prepared by RPS Australia in June 2014 ("the REF");
- Statement of Environmental Effects: Utility Installation, Lot 12, DP 1158508, 617 Freemans Drive, Cooranbong, prepared by Johnson Property Group in May 2014 ("the SEE");
- Report on Preliminary Contamination Assessment: 617 Freemans Drive, Cooranbong, prepared by Cardno Geotech Solutions Pty Ltd in August 2014;
- Operational information as provided by Flow Systems in July 2014;
- Concept Stormwater Management Strategy and Concept Soil and Water Management Plan (SWMP), prepared by Northrop Pty Ltd in June 2014;
- Flood Impacts Assessment, prepared by Hyder Consulting, August 2014;
- The Land Capability Assessment for Recycled Water Management Scheme at Proposed 'North Cooranbong' Master Plan Development, Cooranbong, NSW, prepared by Whitehead & Associates in May 2014; and
- The Staging Assessment for Recycled Water Management Scheme at Proposed 'North Cooranbong' Development, Cooranbong, NSW, prepared by Whitehead & Associates in June 2014.

W&A did not undertake any fieldwork for this investigation.

1.2 Description of Proposed Development

The LWC is proposed to be constructed and operated on part of Lot 12 DP 1158508, as shown by proposed development plans. This report assesses risks to soil and water quality that may arise from the construction and operation of the LWC, as described below.

The proposed LWC will collect sewage from the future residential area at Cooranbong to produce high quality water for reuse.

1.2.1 Construction

Works on the interim flow balance tanks are expected to take two months, commencing in early 2015. Construction, equipping and commissioning of the Cooranbong LWC is expected to take approximately 12 months. Works are anticipated to begin in mid-2015 but may vary depending upon the rate of sales in the North Cooranbong Residential Precinct.

1.2.2 Operation

Sewage will be treated through a multi-stage process of screening, anaerobic and aerobic biological treatments, chemical treatment, membrane filtration, ultraviolet disinfection and chlorination.

The operation of the Cooranbong LWC will be undertaken by Cooranbong Water on the following basis:

- The facility will operate 24 hours a day, 7 days per week;
- The goods to be stored are recycled water and drinking water, which are transported by pipe system to the customers;
- Sewage may be stored in the interim flow balance tanks before discharge within 24 hours during the interim servicing period;
- Chemicals used for treatment and dosing will also be stored on site; and
- Any waste water screenings will be collected and disposed by way of an authorised waste disposal contractor."

1.3 Description of Environment

The Site is located to the north of the existing Cooranbong village and adjoins existing residential areas of the Cooranbong suburb. The Site can be described as previously cleared pastures with remnant and/or regrowth stands of mature native vegetation. The landscape has been previously modified to some degree by vegetation clearing, small-scale agricultural activities and residential development.

2 Potential Soil and Water Impacts from Existing Contamination

2.1 Potential Contamination Sources and Testing

The 'Report on Preliminary Contamination Assessment: 617 Freemans Drive, Cooranbong' (report no. CGS2276) by Cardno Geotech Solutions Pty Ltd ('the Cardno report') was used to assess the risks arising from contaminated soils at the Site. The report was undertaken to a level consistent with SEPP55 as is required for preliminary environmental site assessments.

The Cardno report included a historical review of potential sources of contamination, a site walkover to assess for visual or olfactory indicators of contamination, plus limited check sampling from a total of three (3) soil test pits excavated to depths of 1.2-1.5m, on the location of the proposed LWC facility.

The historical review indicated that clearing had occurred and potential agricultural market gardening undertaken in the 1960's. The Site is listed as potentially contaminated in the s149 certificate for the property. The report concluded that there is the possibility of some historic contamination of the Site by the following sources:

- Potential herbicide and pesticide used on Site as part of previous agricultural uses;
- Potential contamination associated with isolated dumping of household items, building rubble such as bricks and tiles (a number of piles of building waste were observed on aerial photographs of the area by W&A);
- Previous structures;
- Effluent disposal runoff from the upslope dwelling; and
- Potential onsite filling.

Three samples were collected in total, one from 300mm depth in each test pit. The suite of analytes tested by Cardno was as follows:

- Total Petroleum Hydrocarbons (TPH);
- Polycyclic Aromatic Hydrocarbons (PAH);
- Organophosphorus Pesticides (OPP);
- Polychlorinated Biphenyls (PCBs);
- Organochlorine Pesticides (OCP);
- 8 heavy metals and BTEX; and
- Presence of Asbestos.

These analytes are typical contaminants that could arise from the potential historical sources listed above, with the exception of runoff from the existing domestic effluent disposal system at the Site (discussed separately in Section 2.3, below).

All samples were reported with concentrations of analytes below the threshold limits human health based investigation levels for commercial/Industrial land uses, from the *National Environment Protection Measure (Assessment of Site Contamination) Measure*, 2013 (NEPM). Detected contaminants were at very low concentrations relative to the guideline thresholds of the NEPM, and in most cases, the contaminants were below the level of detection.

Therefore, W&A consider that the risks of appreciable soil and water contamination by the contaminants of concern listed above, arising from disturbance of soils within the footprint of the proposed LWC during construction and operation, are considered to be very low to negligible.

If during construction of the LWC, previously unidentified surface or subsurface contamination is encountered, an environmental consultant will be engaged to provide specific assessment and handling advice.

2.2 Domestic Effluent Disposal System

There is currently a residential dwelling located to the north-east of the proposed LWC, which is serviced by an on-site sewage management (OSSM) system that disposes of effluent to soils on the Site. W&A understand that the exact location and extent of the effluent disposal system (likely conventional absorption trenches) has not been identified. Based on the aerial photographs and Site plans, it is possible, that the trenches are located within the construction footprint of the LWC.

The location and extent of the effluent disposal system will be clearly identified prior to any earthworks that may impact on it. If the effluent disposal system, or within 2m of it, is at risk of being disturbed, then the effluent disposal system will be relocated to another part of the Site that will not be disturbed by construction. This will be undertaken in accordance with Council's regulations for OSSM and all required approvals will be obtained.

If the disposal system is located within the footprint of the LWC then the soils disturbed by construction may be impacted with pathogens and viruses. The soils will be assessed and treated in accordance with NSW EPA *Use and Disposal of Biosolids Products*, 2000.

3 Potential Soil and Water Impacts from Site Constraints

3.1 Identified Site Constraints

The Cardno report notes that in addition to the potential for existing contamination, the section 149 certificates obtained from Lake Macquarie City Council ("Council" or "LMCC") indicate that:

- the Site is potentially affected by land slip or subsidence;
- the Site has the potential to contain acid sulphate soils; and
- the Site is subjected to flood related development controls.

3.1.1 Land Slip, Subsidence and Erosion

The Site is underlain by soils belong entirely to the Doyalson (do) soil landscape. The landform of the 'do' soil landscape is described as gently undulating rises with slope gradients <10% and local relief to 30m. Topography is characterised by broad crests and ridges and long, gently inclined slopes. The 'do' soil landscape has moderate to high erosion risks, however landslip is not identified as a constraint, and based on the soil descriptions therein, landslip is not considered to be a likely constraint at the Site.

The 'do' soil landscape occurs across a broad mine subsidence district in the western Lake Macquarie area. However, the SEE states that "the subject allotment is not affected by Mine Subsidence," as shown on the locality plan provided by the Mine Subsidence Board of NSW.

As such, W&A consider that the risk of potential soil and water impacts arising from subsidence is considered to be very low.

However, the moderate to high erosion risk of soils across the Site are a source of potential soil degradation and water contamination (with suspended and dissolved solids) during the construction phase. This will be addressed by adherence to the Concept Stormwater Management Strategy and the SWMP (or/and any future plans) to manage erosion and sediment control during construction).

Erosive soils pose an ongoing risk to water quality and soil degradation during the operation phase, if they are exposed. All exposed soils should be appropriately covered (i.e. with vegetation, mulch, hardstand areas or LWC infrastructure) to minimise the erosion risk, as per the Concept Stormwater Management Strategy and the SWMP.

3.1.2 Acid Sulphate Soils

The Acid Sulphate Risk Map for Morisset (1995) confirms that the incidence of potential acid sulphate soils is limited to the southernmost portion of the Site, at depths of at least 3m below ground surface level. This portion of the Site is earmarked for Conservation zoning and is not proposed to be disturbed by any construction activities. Therefore the risks of appreciable soil and water impacts arising from disturbance of acid sulphate soils are considered to be very low.

3.1.3 Flooding

The 1:100 year flood level intersects the southern portion of the Site; south of the proposed LWC footprint. As identified in the Hyder Consulting report (2014), the 1:5 AEP flood level is at 4.2m and the LWC itself will be situated on elevated land at a minimum of 8m AHD. Therefore, the risks of soil and water contamination arising from flood events once the LWC is constructed and operational, are predicted to be very low.

Site access during the construction phase will be via a temporary gravel road connecting the existing driveway access to Freemans Drive. This temporary gravel road will be below the 1:100 year flood level. Best practice for erosion and sediment control dictates that construction works are not to be scheduled during periods of prolonged and/or heavy rainfall. Weather forecasts will be used in construction planning to reduce the likelihood of flood impacts; and a SWMP will be followed during construction to manage erosion and sediment control.

4 Potential Contamination from LWC Operation

4.1 Construction

The potential soil and water impacts that could result from construction activities have been identified and addressed in Sections 2 and 3 above. The operational risks that could arise from pre-existing Site conditions have also been addressed in Section 3. The potential soil and water impacts that could result from the ongoing operation of the proposed LWC are addressed below.

4.2 Standard Operating Procedures

W&A understand that standard operating procedures and associated documentation will be developed prior to commissioning of the LWC, similar to those developed for Flow Systems' other subsidiary companies (such as Pitt Town Water) and in accordance with The Australian Water Recycling Guidelines (2006 & 2008), and regulations under the NSW Water Industry Competition Act 2006 ("WICA"). The standard operating procedures will be developed to address the identified risks (including incidents and emergencies).

4.3 Overview of LWC Operation

Reference is made to Section 1.2.2 of this report and the 'Sewerage and Recycled Water Process Flow Diagram' prepared for Flow Systems (June 2014). The flow diagram summarises the treatment processes, materials used, products and waste products, as discussed below.

4.3.1 Treatment Materials

A range of chemical compounds will be used in the treatment process, including:

- Alum;
- Activated Carbon (in granular or powdered form);
- Citric Acid;
- Caustic soda; and
- Chlorine

The compounds will be relatively small in volume and easily stored within appropriate containers secured within the LWC compound. The risks of soil and water contamination resulting from spillage from, or inappropriate storage or handling of, the WAS on the Site are considered to be very low.

4.3.2 Recycled Water

The product of the LWC is high quality recycled water, which is provided to customers via dual (third-pipe) reticulation. According to advice from Flow Systems, the expected quality of the recycled water is as follows:

- Total Nitrogen (TN): ≤15mg/L;
- Total Phosphorus (TP): 2-5mg/L;
- Biological Oxygen Demand (BOD_5): ≤10mg/L;
- Total Suspended Solids (TSS): ≤10mg/L;
- Faecal Coliforms: ≤10cfu[1]/100mL;
- Total Dissolved Solids (TDS): 700mg/L; and
- Electrical Conductivity (EC): ~1,000µS/cm

4.3.3 Waste Products

According to information provided by Flow Systems, the identified waste products from process and operation are:

- Dewatered Waste Activated Sludge (WAS), including membrane screenings, which will be disposed off-site in a licenced solid waste facility or Hunter Waters existing sewerage network under a trade waste agreement, as agreed;
- Dewatered screenings collected and disposed off-site by a licensed waste contractor; and
- Foul air, which will be treated by odour scrubbers prior to release from a high vent.

[1] colony forming units

The WAS and dewatered screenings are expected to be relatively minor in volume and easily stored within appropriate containers secured within the LWC compound. The risks of soil and water contamination resulting from spillage from, or inappropriate storage or handling of, the WAS on the Site are considered to be very low.

4.3.4 Contingencies

In any complex engineering operation, contingency procedures need to be developed in case of system error or malfunction etc. Flow Systems has prepared a preliminary risk assessment to examine risks associated with the operation of the treatment facility including tank and/or equipment failure, odour, noise, process risks, capacity, power failure, telemetry, vandalism, operator error, flooding etc. Risk mitigation measures are presented to address the identified risks, and the residual or post-mitigation risks are also discussed.

Based on this preliminary risk assessment, W&A conclude that appropriate controls to reduce risks to surface waters in the stormwater collection and detention system will be implemented. An operation and management plan will also be developed for the LWC that will address these and other contingency events.

5 Conclusions

This report provides an assessment of the potential impacts on soil and surface waters that could result from the construction and operation of the proposed LWC at 617 Freemans Drive, Cooranbong (Lot 12 DP 1158508). It addresses a broad range of potential hazards that could arise from disturbing the existing soils at the Site during construction, and from ongoing operation of the LWC.

In general terms, the information presented for review suggests that the potential risks to soil and water are manageable, provided that appropriate mitigation controls and adaptive management measures are in place for the construction of the LWC and for the entirety of its operational life.

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Appendix 10

Odour Impact Assessment

Pacific Environment Limited

Consulting • Technologies • Monitoring • Toxicology

Report

COORANBONG LOCAL WATER CENTRE

RPS AUSTRALIA & ASIA PACIFIC

Job ID. 08756

7 August 2014

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JOB ID:	08756
DOCUMENT CONTROL NUMBER	AQU-NW-003-08756
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1 INTRODUCTION

This report has been prepared by Pacific Environment for RPS Australia Asia Pacific (RPS) on behalf of Johnson Property Group (JPG). The proposed development involves construction, operation and maintenance of a water recycling facility known as the Cooranbong Local Water Centre (LWC) and will provide all future properties within the development with drinking water, sewerage and recycled water. The facility will be constructed and operated by private licensed operator, Cooranbong Water, a wholly owned subsidiary of Flow Systems Pty Ltd.

The study seeks to determine the odour concentrations at nearby sensitive receptors using atmospheric dispersion modelling. Odour monitoring data collected at an existing Flow Systems water recycling facility located at Pitt Town, NSW, are used as inputs into the model. Modelling has been completed using the US-EPA regulatory AERMOD model, suitable for use in NSW.

The report comprises the following components:

- Description of the project,
- Discussion of air quality issues with respect to odour,
- Review of the dispersion meteorology in the area, and
- An assessment of potential odour impacts for four operational scenarios.

2 PROJECT DESCRIPTION

The project site (shown on **Figure 2.1**), is part of a proposed urban release area located directly northeast of the town of Cooranbong, approximately 30km southwest of Newcastle.

Provision of this infrastructure, namely the LWC, will allow subdivision of lands within an area being developed by JPG. The land is being rezoned for residential development.

The Cooranbong LWC will utilise sewage from the future residential area to produce high quality water. The sewage will be treated at the site to provide recycled water plumbed into houses for non-potable uses such as toilet flushing, washing machines, irrigation and car washing, thus reducing potable water demand. The facility, located upon part of Lot 12 DP 1158508, is intended to operate 24 hours, 7 days per week, housed in a low-scale, single level building within an open space setting.

The intended biological capacity of the Cooranbong LWC is approximately 1,500kL per day, although the facility has been designed to achieve this benchmark over time in line with uptake in the residential area surrounding the development.

Two potable water storage tanks are located in the northern part of the site. A further two tanks to store recycled water are located to the southern part of the site. Capacity is approximately 1.2 million litres each, and will stand approximately 5m high above ground level, and approximately 20m diameter. The tanks will be constructed of steel and sit in a compacted earth and gravel area.

Tanks within the Cooranbong LWC will be interconnected with pipes and pumps and the like to each other, and to the Cooranbong LWC building. Pumps for potable water and recycled water tanks are to be housed in sheds of Colorbond material for weather and acoustic screening.

For the first lots in the precinct, interim flow balance tanks (FBTs) may collect raw sewage to be discharged to the Hunter Water sewer until the LWC is built and commissioned. An interim odour control unit associated with these tanks will operate during this initial period.

A more detailed proposed site layout plan is shown in **Figure 2.2**. The potential sources of odour are from the screens (enclosed) used to remove inorganic material larger than prior to treatment of the

liquid flow, as well as emissions from the individual odour scrubbers attached to both the permanent and interim FBTs and vented via a stack. Further descriptions of these sources and the measured data used for this assessment are presented in **Section 5**.

Figure 2.1: Proposed project site location

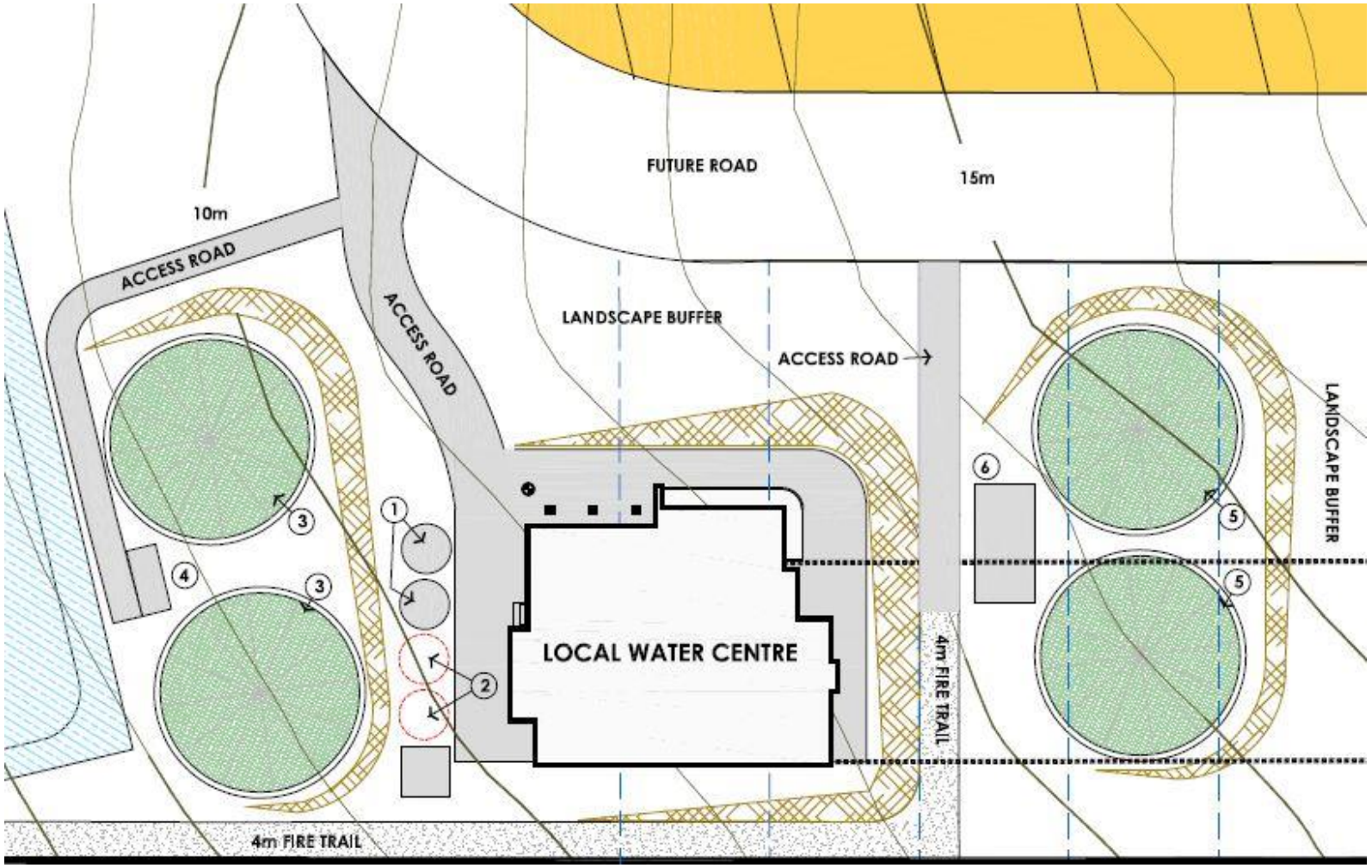

Figure 2.2: Proposed Plant Layout

3 DISCUSSION OF AIR QUALITY ISSUES

3.1 Odour Performance Criteria

3.1.1 Introduction

The determination of air quality goals for odour and their use in the assessment of odour impacts is recognised as a difficult topic in air pollution science. The topic has received considerable attention in recent years and the procedures for assessing odour impacts using dispersion models have been refined considerably. There is still considerable debate in the scientific community about appropriate odour goals as determined by dispersion modelling.

The NSW Environment Protection Authority (NSW EPA) has developed odour goals and the way in which they should be applied with dispersion models to assess the likelihood of nuisance impact arising from the emission of odour.

There are two factors that need to be considered:

1. What "level of exposure" to odour is considered acceptable to meet current community standards in NSW and
2. How can dispersion models be used to determine if a source of odour meets the goals which are based on this acceptable level of exposure

The term "level of exposure" has been used to reflect the fact that odour impacts are determined by several factors the most important of which are (the so-called **FIDOL** factors):

- the **F**requency of the exposure
- the **I**ntensity of the odour
- the **D**uration of the odour episodes
- the **O**ffensiveness of the odour
- the **L**ocation of the source

In determining the offensiveness of an odour it needs to be recognised that for most odours the context in which an odour is perceived is also relevant. Some odours, for example the smell of sewage, hydrogen sulfide, butyric acid, landfill gas etc., are likely to be judged offensive regardless of the context in which they occur. Other odours such as the smell of jet fuel may be acceptable at an airport, but not in a house, and diesel exhaust may be acceptable near a busy road, but not in a restaurant.

In summary, whether or not an individual considers an odour to be a nuisance will depend on the FIDOL factors outlined above and although it is possible to derive formulae for assessing odour annoyance in a community, the response of any individual to an odour is still unpredictable. Odour goals need to take account of these factors.

3.1.2 Complex Mixture of Odorous Air Pollutants

The Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW (**EPA, 2005**) include ground-level concentration (glc) criterion for complex mixtures of odorous air pollutants. They have been refined by the NSW EPA to take account of population density in the area. **Table 3.1** lists the odour glc criterion to be exceeded not more than 1% of the time, for different population densities.

The difference between odour goals is based on considerations of risk of odour impact rather than differences in odour acceptability between urban and rural areas. For a given odour level there will be a wide range of responses in the population exposed to the odour. In a densely populated area there will therefore be a greater risk that some individuals within the community will find the odour

unacceptable than in a sparsely populated area. A value of 1 OU is the theoretical level at which odour becomes detectable.

The most stringent of the impact assessment criterion of 2 OU (at the 99th percentile; **EPA, 2005**) has been applied for this assessment.

Table 3.1: Odour Performance Criteria for the Assessment of Odour

Population of affected community	Criteria for complex mixtures of odour (OU)
≤ ~2	7
~10	6
~30	5
~125	4
~500	3
Urban (>2000) and/or schools and hospitals	2

3.2 Peak-to-mean ratios

It is common practice to use dispersion models to determine compliance with odour goals. This introduces a complication because Gaussian dispersion models directly predict concentrations over an averaging period of 3-minutes or greater. The human nose, however, responds to odours over periods of the order of a second or so. During a 3-minute period, odour levels can fluctuate significantly above and below the mean depending on the nature of the source.

To determine more rigorously the ratio between the one-second peak concentrations and 3-minute and longer period average concentrations (referred to as the peak-to-mean ratio) that might be predicted by a Gaussian dispersion model, the EPA commissioned a study by **Katestone Scientific Pty Ltd (1995, 1998)**. This study recommended peak-to-mean ratios for a range of variables, such as source type, receptor distance, stability class and stack height (for point sources).

It is important to note that those peak-to-mean factors determined are based on the Pasquill-Gifford stability classes. Since AERMOD replaces the Pasquill-Gifford stability based dispersion with a turbulence-based approach that uses the Monin-Obukhov length scale to account for the effects of atmospheric turbulence based dispersion, a conservative approach has been taken for area sources and a value of 2.5 has been applied. A value of 2.3 has been applied for wake-affected point and volume sources. A summary of the factors is provided in **Appendix A**.

The Approved Methods take account of this peaking factor and the goals shown in **Table 3.1** are based on nose-response time.

4 LOCAL METEOROLOGY

This section described the dispersion meteorology in the study area. Information on prevailing wind patterns, atmospheric stability and climatic conditions are presented.

4.1 Wind speed and direction

Meteorological data are collected by the Bureau of Meteorology from Cooranbong, NSW, approximately 1.7 km south of the site. Wind roses of the data collected from Cooranbong are shown in **Figure 4.1**. The wind roses show that on an annual basis winds are predominantly from the east and south-western quadrant. The patterns in spring and autumn are similar. The easterlies and are more pronounced in summer, with very few winds from the north-western sector. The pattern in winter is different again, with winds in the south-western and north-western quadrant dominating. On an annual basis, the average wind speed is 1.2 m/s with approximately 48.9% of calms (<0.5 m/s). This is an

unusually high proportion of very low wind speeds, but is also likely to provide a conservative assessment as these are generally worst case dispersion conditions.

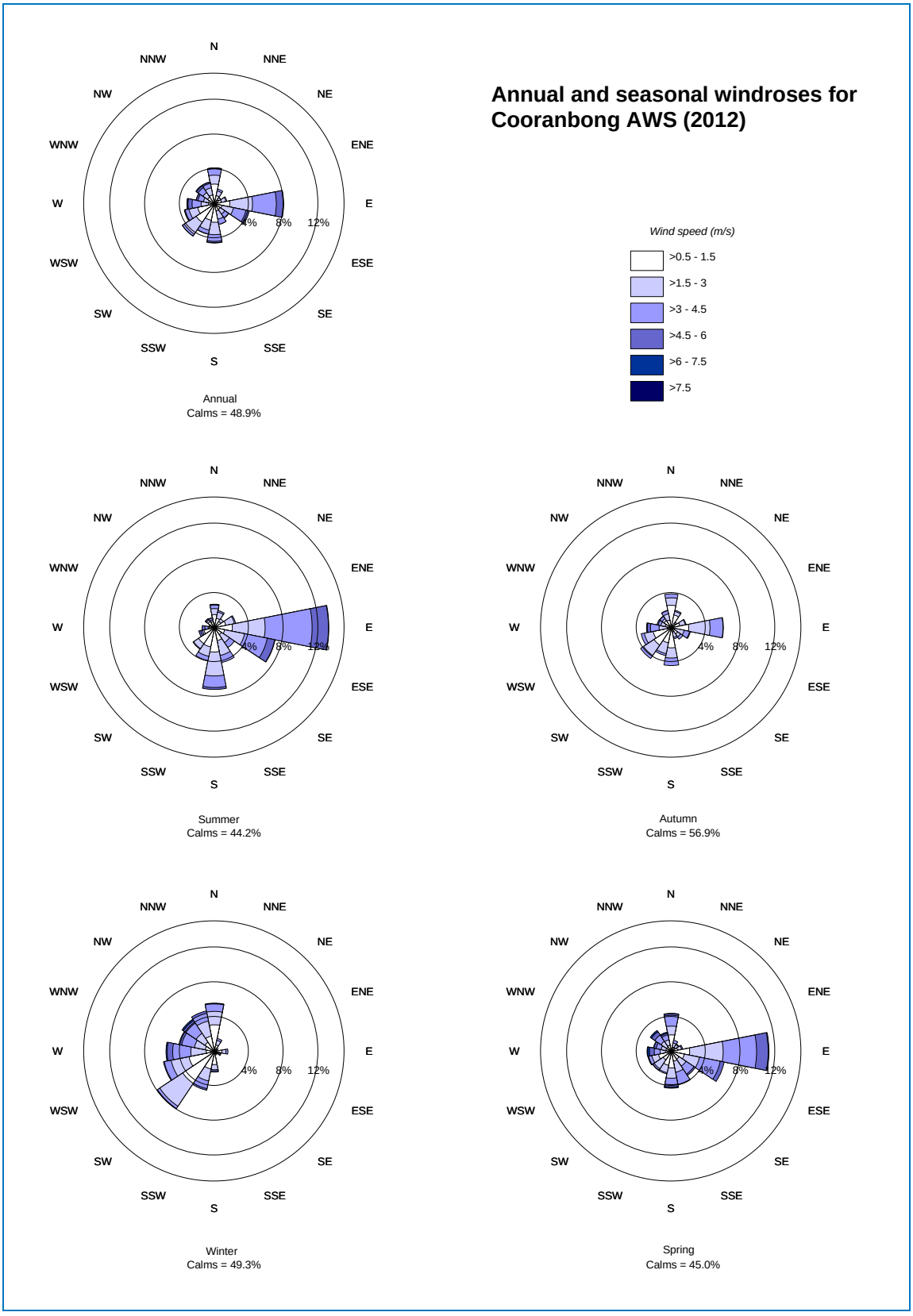

Figure 4.1: Annual and Seasonal wind roses for Cooranbong BoM Station (2012)

4.2 Climatic Conditions

The Bureau of Meteorology (BoM) collects climatic information in the vicinity of the study area. The Cooranbong weather station has only been measuring data from 2008, therefore it does not provide a long enough dataset to characterise climatic condition. Alternatively, reference to the climatic information collected at Norah Head has been adopted and is presented in **Table 4.1** (**BoM, 2014**). This weather station is located 23km from the project site.

The annual average maximum temperature recorded at the site is 22.1°C, the annual average minimum temperature is 15.1°C. The highest maximum temperature of 25.8°C is recorded in January and February, while the lowest minimum temperature of 9.7°C is recorded in July. The annual average humidity is 71% at 9am and 65% at 3pm. The annual average rainfall is 1,163 mm, falling throughout the year over approximately 143 rain days.

Table 4.1: Temperature, Humidity and Rainfall for Norah Head BoM Station

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Daily Maximum Temperature (°C)													
Mean	25.8	25.8	24.8	22.8	20.0	18.0	17.2	18.9	21.0	22.4	23.5	24.8	**22.1**
Daily Minimum Temperature (°C)													
Mean	19.6	19.9	18.7	15.8	13.0	10.9	9.7	10.5	12.8	14.7	16.7	18.4	**15.1**
9am Mean Relative Humidity (%)													
Humidity	76	78	76	71	72	72	69	63	64	65	72	72	**71**
3pm Mean Relative Humidity (%)													
Humidity	70	72	69	65	64	63	59	56	60	64	68	68	**65**
Rainfall (mm)													
Monthly mean	75	111	107	127	153	144	94	67	65	53	101	66	**1,163**
Raindays (Number)													
Mean no. of raindays	12	12	13	13	14	14	11	9	11	10	13	11	**143**

Station number: 061273; Commenced 1989; Status: Open; Elevation: 19 m AHD; Latitude: 32.28 °S; Longitude: 151.58 °E.
Source: **BoM (2014)**

5 ODOUR EMISSIONS

To characterise the potential odour impacts of the proposed development, odour sampling was completed at a similar facility in Pitt Town, NSW (**Pacific Environment, 2013**). The purpose of the monitoring was to characterise the odour from the existing facility and use the data to derive odour emission rates (OERs) for use in odour impact assessments for future proposed facility.

5.1 Monitoring Methodology

Odour samples from each chamber were taken using an isolation flux hood (in accordance with AS/NZS 4323.4:2009 "Area source sampling – Flux chamber technique" and the method described in the US EPA technical report "EPA/60068-86/008"). The IFH was floated on the surface of each chamber and odour-free nitrogen was forced into the hood via odour free Teflon tubing until it has reached equilibrium. The nitrogen flow (5 L/min) purges the flux hood with a residence time of 4 times the chamber volume occurring before sampling begins (24 minutes). The odorous sample is then drawn at a sample rate of approximately 3 L/min over a period of 30 minutes into a single use, odour-free Nalophan sample bag, secured inside a drum kept under vacuum using a pump. Odour samples from the Flow Balance Tank were taken using the standard "lung in a drum" method, whereby an odorous sample of air is drawn from the source, at a sample rate of approximately 3 L/min, into a single use odour-free Nalophan sample bag. The bag is secured inside a drum kept under vacuum using a pump.

- 1 x sample taken at the MBR Membrane Chamber. The sample was drawn from the surface of the liquid inside the chamber.
- 1 x sample taken at the MBR Aerobic Chamber. The sample was drawn from the surface of the liquid inside the chamber.
- 1 x sample taken at the MBR Anoxic Chamber. The sample was drawn from the surface of the liquid inside the chamber.
- 1 x sample taken at the FBT Odour Control Unit (OCU) Vent. The sample was drawn from the OCU vent via Teflon tubing that was placed in the top of the vent.

The odour samples were collected on the morning of 18 March 2013. Following collection, odour samples were analysed within 30 hours at a NATA accredited laboratory using dynamic olfactometry[a] (in accordance with AS/NZS 4323.3:2001 "Determination of Odour Concentration by Dynamic Olfactometry" (**AS/NZS, 2001**).

[a] There are no instrument-based methods that can measure an odour response in the same way as the human nose and "dynamic olfactometry" is therefore the preferred method for odour analysis. Dynamic olfactometry is the measurement of odour by presenting a sample of odorous air to a panel of people with decreasing quantities of clean odour-free air. The panellists then note when the smell becomes detectable. The correlations between the known dilution ratios and the panellists' responses are then used to calculate the number of dilutions of the original sample required to achieve the odour detection threshold. The units for odour measurement using dynamic olfactometry are "odour units" (OU) which are dimensionless and are effectively "dilutions to threshold".

5.2 Monitoring Results

The results of the odour monitoring are presented as odour concentrations measured in odour units (OU) in **Table 5-1**. The laboratory report from the odour monitoring is presented in **Appendix B**.

Table 5-1: Odour Monitoring Results

Sample	Date	Time	Odour Concentration (OU)	Specific Odour Emission Rate ($OU.m^3/s/m^2$)[b]	Odour Character
1 – MBR Tank – Chamber Membrane	18/03/2013	14:05	34	N/A	Musty
2 – MBR Tank – Aerobic Membrane	18/03/2013	14:44	42	N/A	Musty
3 – MBR Tank –Anoxic Chamber	18/03/2013	15:44	52	0.03	Musty, Rubbery, Garlic
4 – FBT OCU Vent	18/03/2013	16:15	446	N/A	H_2S, Rotten Egg, Cabbage

[b] Specific odour emission rate (SOER) is calculated from the sweep gas flow rate and area of flux hood. That is: SOER = odour concentration (ou) x sweep gas flow rate (Nm^3/s) x area (m^2). The SOER is only used when the source is represented as an area source. For volume and point sources, the measured odour concentration is multiplied by the volumetric flow rate to determine an estimated emission rate.

6 APPROACH TO ASSESSMENT

The overall approach to the assessment follows the Approved Methods which specify how assessments based on the use of air dispersion models should be completed. They include guidelines for the preparation of meteorological data to be used in dispersion models and the relevant air quality criteria for assessing the significance of predicted concentration and deposition rates from the project. The approach taken in this assessment follows as closely as possible the approaches suggested by the guidelines.

The air dispersion modelling conducted for this assessment is based on an advanced modelling system using the AERMET/AERMOD model. AERMOD was chosen as the most suitable model due to the source types, location of nearest receptors and nature of local topography. AERMOD is the US-EPA's recommended steady-state plume dispersion model for regulatory purposes. AERMOD replaced the Industrial Source Complex (ISC) model for regulatory purposes in the US in December 2006 as it incorporates more recent, and potentially more accurate, algorithms to represent both meteorological interactions and air quality dispersion. AUSPLUME, a steady state Gaussian plume dispersion model developed by the Victorian EPA and frequently used in Australia for simple near-field applications is based on ISC, which has now been replaced by AERMOD.

A significant feature of AERMOD is the Pasquill-Gifford stability based dispersion is replaced with a turbulence-based approach that uses the Monin-Obukhov length scale to account for the effects of atmospheric turbulence based dispersion.

The AERMOD system includes AERMET, used for the preparation of meteorological input files and AERMAP, used for the preparation of terrain data. Terrain data were sourced from NASA's Shuttle Radar Topography Mission (SRTM) Data (3 arc-second (~90m) resolution) and processed within AERMAP to create the necessary input files.

AERMET requires surface and upper air meteorological data as inputs. Surface data were sourced from the BoM meteorological station at Cooranbong located approximately 1.7km south of the Project. Cloud cover data are required for AERMET and these were sourced from the Williamtown RAAF BoM station, the closest available dataset to the project site.

Appropriate values for three surface characteristics are required for AERMET as follows:

- Surface roughness, which is the height at which the mean horizontal wind speed approaches zero, based on a logarithmic profile.
- Albedo, which is an indicator of reflectivity of the surface.
- Bowen ratio, which is an indicator of surface moisture.

Values of surface roughness, bowen ratio and albedo were determined based on a review of aerial photography for a radius of 3 km centred on the Project site. Default values for cultivated land were chosen for a single sector sectors to represent the land use type in the surrounding area.

Building wake effects were included in the modelling simulations to represent the plant building on-site at a height of 3.5 m. The OCU stack was represented as a point source at 6.4 m above ground level.

Odour emission rates (OER) and other input parameters are shown in **Table 6.1**, **Table 6.2** and **Table 6.3** for point, volume and area sources respectively. The OERs from the measured data and the OERs used in the modelling are both presented. The modelled OERs include a peak-to-mean of 2.3 for volume and point sources, and a value of 2.5 for area sources.

Table 6.1: Modelling parameters used for point sources (OCU stack)

Model Parameter	Value
Stack location (MGA) Source 1	356,097mE 6339,755mN
Stack location (MGA) Source 2	356,101mE 6339,736mN
Release height	6.4 m
Temperature	27.75 °C
Stack diameter	0.3 m
Exit velocity	11.8 m/s
Flow rate	0.83 m^3/s
Measured odour concentration	446 OU
Odour emission rate (OER)	371.7 $OU.m^3/s$
Peak to mean factor	2.3
OER incorporating peak to mean	854.8 OU/s

Table 6.2: Modelling parameters used for volume sources

Source Name	Odour Concentration (OU)	Flow Rate (m^3/s)	OER ($OU.m^3/s$)	Peak to mean factor	OER used for modelling ($OU.m^3/s$)	Source ID
Membrane Tank A	34	0.28	9.5	2.3	21.8	3
Membrane Tank B	34	0.28	9.5	2.3	21.8	4
Bioreactor A	42	0.28	11.7	2.3	26.9	5
Bioreactor B	42	0.28	11.7	2.3	26.9	6

Table 6.3: Modelling parameters used for area sources

Source Name	Odour Concentration (OU)	SOER ($OU.m^3/s/m^2$)	Area (m^2)	Peak to mean factor	SOER used for modelling ($OU.m^3/s$)	Source ID
Pre-anoxic Tank A	52	0.03	17	2.5	0.08	7
Pre-anoxic Tank B	52	0.03	17	2.5	0.08	8
Post-anoxic Tank A	52	0.03	10	2.5	0.08	9
Post-anoxic Tank B	52	0.03	10	2.5	0.08	10

For the purposes of presenting the results, all predicted odour levels at each receptor have been retained by the model and a contour plot has been prepared showing the distribution of the 99th percentile 1-hour levels at ground-level. The 99th percentile levels are plotted as the impact assessment criteria are set to ensure that the predicted odour level is not exceeded more than 1% of the year. Predicted odour levels are shown in **Section 7**.

7 ASSESSMENT OF IMPACTS

The odour impact at the site was assessed for two scenarios as follows:

- Only interim FBTs operational
- Fully operational plant and interim FBTs decommissioned

A summary of the odour modelling results is for both the interim FBTs and operations scenarios.

The predicted odour concentrations for the interim FBTs and for the fully operational plant are provided in **Table 7.1**. The corresponding contour plots are shown in **Figure 7.1** and **Figure 7.2** for the respective scenarios. It should be noted that peak-to-mean factors have been taken into account in the modelling and are included in the results table and contour plots.

All odour concentrations are predicted to be below the EPA criterion of 2 OU at all receptors investigated. For the interim FBT scenario the 1 OU level of detection is not reach at any receptor beyond the boundary (at the 99th percentile). **Figure 7.1** shows the maximum level predicted of 0.3 OU, less than half the limit of detection. It can be seen from both plots that 2 OU criterion is not predicted beyond the boundary of the plant, for either scenario.

Table 7.1: 99th percentile odour modelling results at receptors (OU)

Receptor ID	Interim scenario	Operations scenario
Criterion	***2.0***	***2.0***
1	<0.1	0.1
2	<0.1	0.1
3	0.1	0.2
4	0.1	0.2
5	0.1	0.3
6	0.1	0.2
7	0.1	0.2
8	0.2	0.1
9	0.2	0.1
10	0.1	0.1
11	0.1	0.1

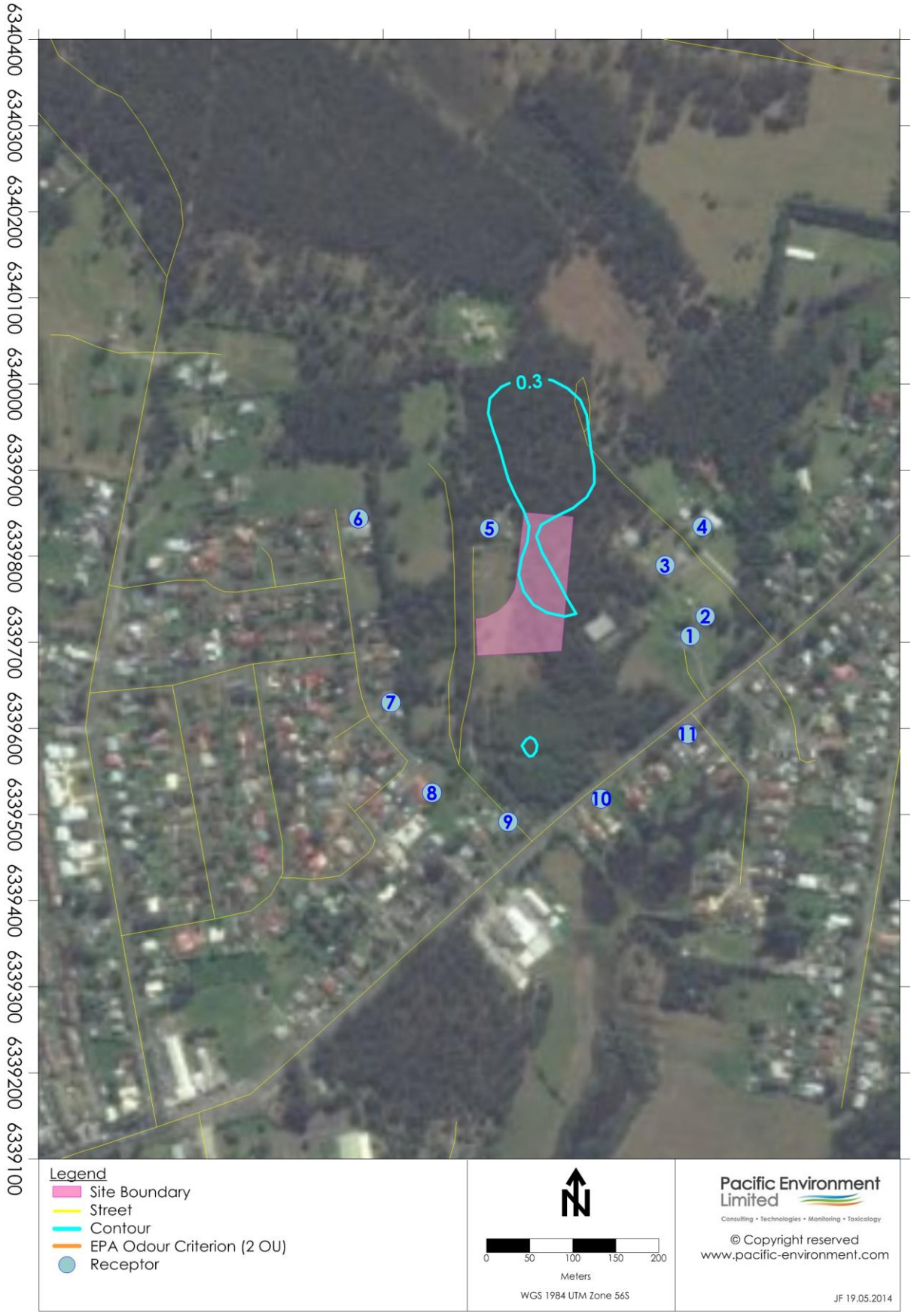

Figure 7.1: Predicted 99th percentile odour concentration (OU) for Interim FBT operations

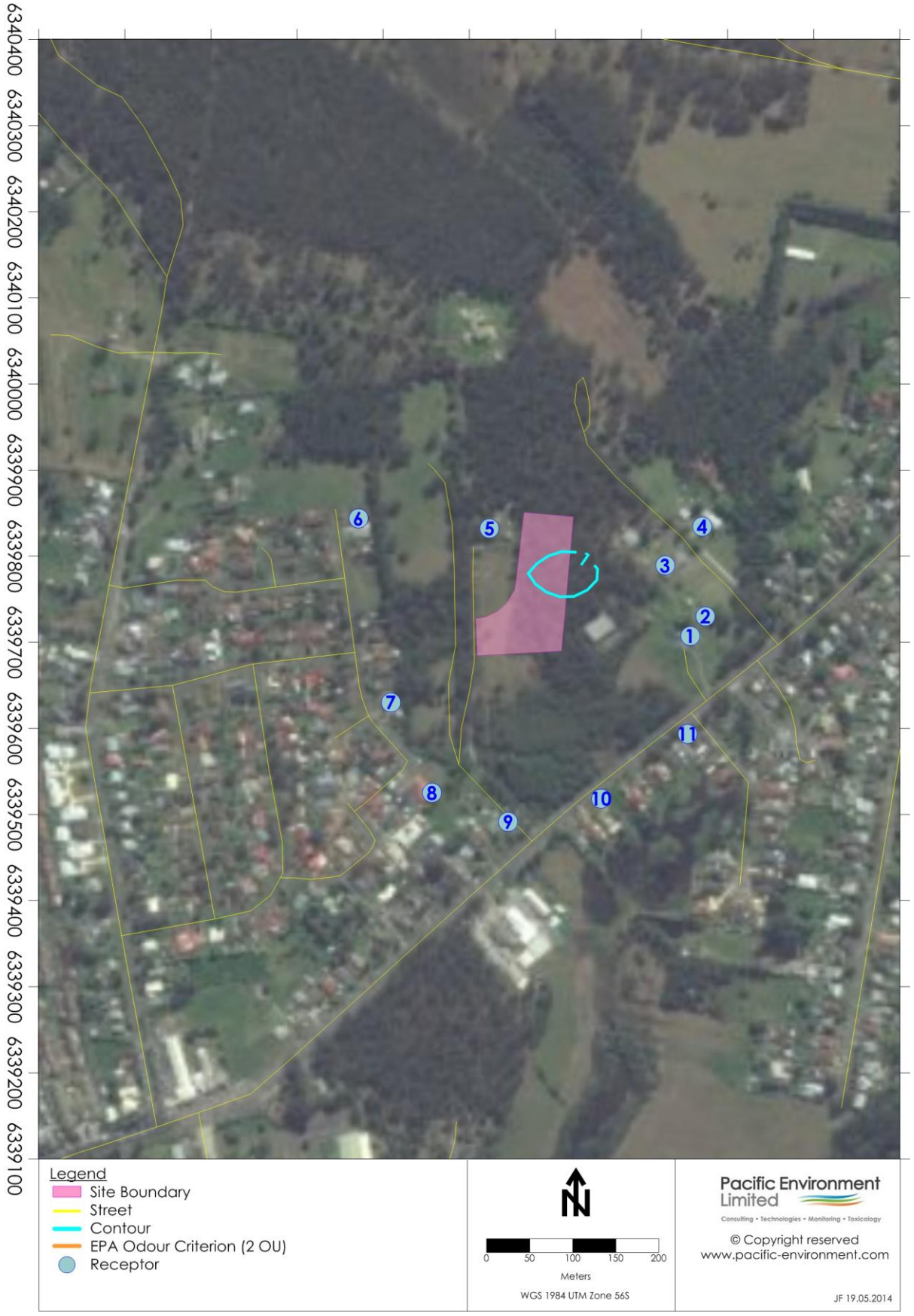

Figure 7.2: Predicted 99th percentile odour concentration (OU) for the fully operational plant

8 CONCLUSIONS

This study assessed the air quality impacts of the proposed Local Water Centre at Cooranbong. The odour assessment was based on odour emission rates derived from measurements at a similar facility and combined with local meteorological data and computer-based dispersion modelling to determine air quality impacts on the proposed residential areas in the vicinity of the plant.

Results from the dispersion modelling using all measured data indicated that predicted odour concentrations from the proposed facility would comply with the most stringent assessment criterion of 2 OU (99th percentile) at all sensitive receivers.

The predicted odour concentrations are at or below 1 OU (99th percentile), the theoretical level at which odour becomes detectable but not necessarily distinguishable, at all receivers.

9 REFERENCES

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"Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW", August 2005

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"Odour and hydrogen sulphide monitoring for Pitt Town Water Factory" Report 7198, 22 February 2013.

Appendix A PEAK TO MEAN RATIOS

Table A.1: Factors for Estimating Peak Concentration

Source Type	Pasquill-Gifford stability class	Near field P/M60*	Far field P/M60
Area	A, B, C, D	2.5	2.3
	E, F	2.3	1.9
Line	A – F	6	6
Surface point	A, B, C	12	4
	D, E, F	25	7
Tall wake-free point	A, B, C	17	3
	D, E, F	35	6
Wake-affected point	A – F	2.3	2.3
Volume	A – F	2.3	2.3

*Ratio of peak 1-second average concentrations to mean 1-hour average concentrations

Appendix B ODOUR MEASUREMENTS FROM PITT TOWN

THE ODOUR UNIT PTY LIMITED

Accreditation Number: 14974

Odour Sample Measurement Results
Panel Roster Number: SYD20130319_023

Sample Location	TOU Sample ID	Sampling Date & Time	Analysis Date & Time	Panel Size	Valid ITEs	Nominal Sample Dilution	Actual Sample Dilution (Adjusted for Temperature)	Sample Odour Concentration (as received, in the bag) (ou)	Sample Odour Concentration (Final, allowing for dilution) (ou)	Specific Odour Emission Rate ($ou.m^3/m^2/s$)
Sample #1 – Membrane Chamber	SC13176	18/03/2013 1405hrs	19/03/2013 1031hrs	5	10	-	-	34	34	N/A
Sample #2 – Aerobic Chamber	SC13177	18/03/2013 1444hrs	19/03/2013 1059hrs	5	10	-	-	42	42	N/A
Sample #3 – Anoxic Chamber	SC13178	18/03/2013 1544hrs	19/03/2013 1127hrs	5	10	-	-	52	52	N/A
Sample #4 – FBT OCU Vent	SC13179	18/03/2013 1615hrs	19/03/2013 1201hrs	5	10	-	-	446	446	N/A
Sample #5 – FTB Headspace	SC13180	18/03/2013 1645hrs	19/03/2013 1227hrs	5	10	-	-	114,000	114,000	N/A

Note: The following are not covered by the NATA Accreditation issued to The Odour Unit Pty Ltd:
1. The collection of Isolation Flux Hood (IFH) samples and the calculation of the Specific Odour Emission Rate (SOER).
2. Final results that have been modified by the dilution factors where parties other than The Odour Unit Pty Ltd. have performed the dilution of samples.

Appendix 11

Acoustic Assessment

ACOUSTICS AND AIR

COORANBONG LOCAL WATER CENTRE

ENVIRONMENTAL IMPACT STATEMENT (ACOUSTICS)

REPORT NO. 14136-EIS
VERSION B

JULY 2014

PREPARED FOR

RPS AUSTRALIA ASIA PACIFIC
241 DENISON ST
BROADMEADOW NSW 2292

WILKINSON MURRAY

DOCUMENT CONTROL

Version	Status	Date	Prepared By	Reviewed By
A	Draft	23 July 2014	Jeffrey Peng	John Wassermann
A	FINAL	29 July 2014	Jeffrey Peng	-
B	FINAL	8 August 2014	John Wassermann	-

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This firm is a member firm of the Association of Australian Acoustical Consultants and the work here reported has been carried out in accordance with the terms of that membership.

Celebrating 50 Years in 2012
Wilkinson Murray is an independent firm established in 1962, originally as Carr & Wilkinson. In 1976 Barry Murray joined founding partner Roger Wilkinson and the firm adopted the name which remains today. From a successful operation in Australia, Wilkinson Murray expanded its reach into Asia by opening a Hong Kong office early in 2006. 2010 saw the introduction of our Queensland office and 2011 the introduction of our Orange office to service a growing client base in these regions. From these offices, Wilkinson Murray services the entire Asia-Pacific region.

TABLE OF CONTENTS

GLOSSARY OF ACOUSTIC TERMS

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph below, are here defined.

Maximum Noise Level (L_{Amax}) – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

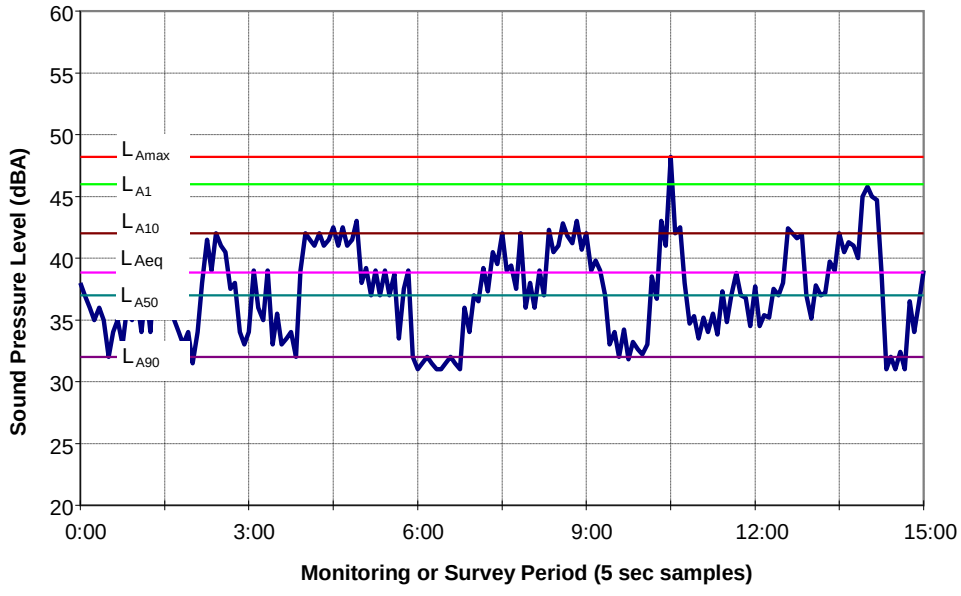
L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

ABL – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night time) for each day. It is determined by calculating the 10th percentile (lowest 10th percent) background level (L_{A90}) for each period.

RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period – daytime, evening and night time.

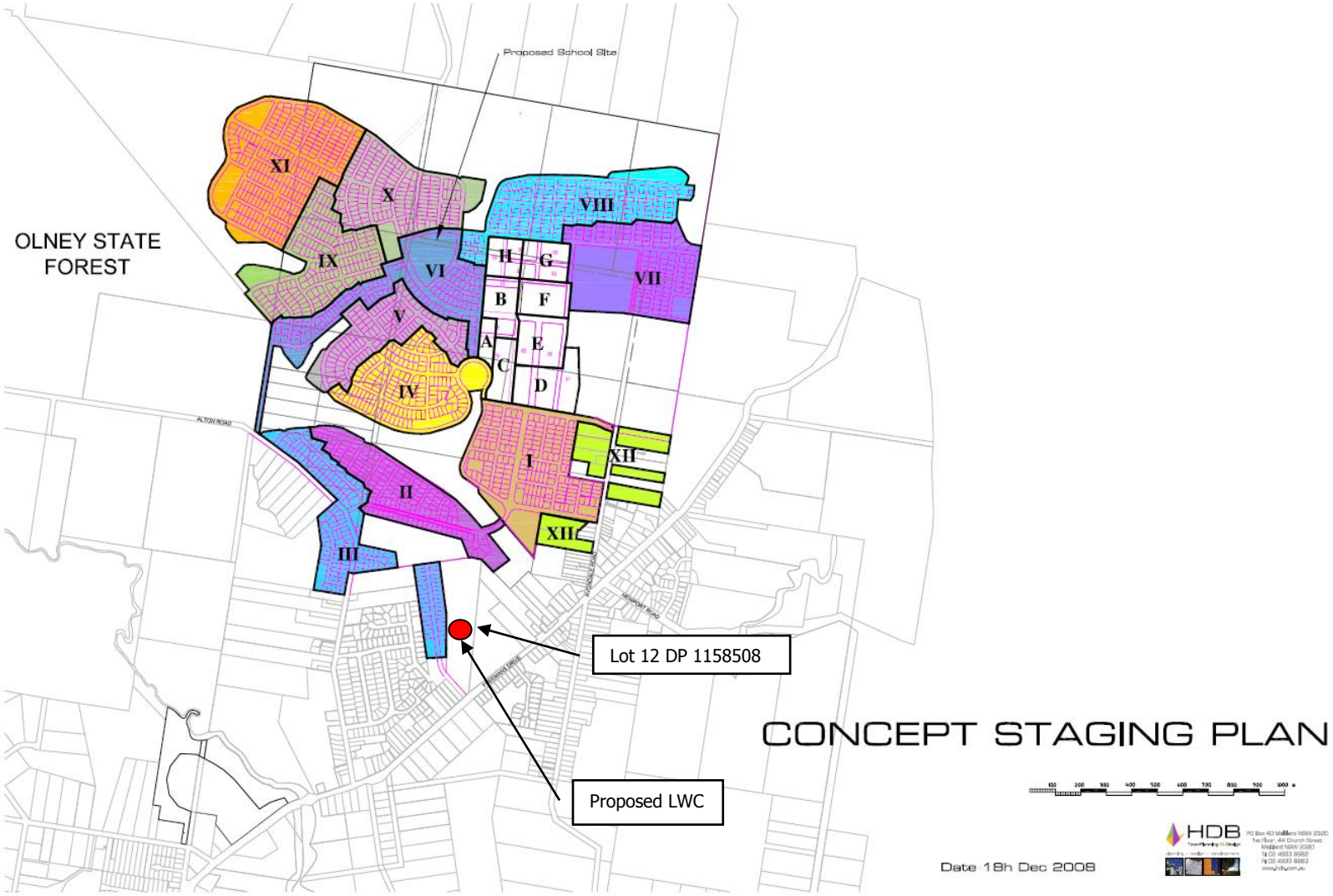
Typical Graph of Sound Pressure Level vs Time



1 INTRODUCTION

Wilkinson Murray Pty Ltd has been engaged by RPS Australia Asia Pacific on behalf of Johnson Property Group (JPG) to provide an operational noise assessment of the proposed Local Water Centre (LWC) located within the North Cooranbong Residential Precinct. The LWC is to be located on part of Lot 12 DP 1158508 at the southernmost area of the North Cooranbong Residential Precinct as shown in Figure 1-1. The noise assessment evaluates potential noise and vibration impacts associated with the construction and operation of the facility in accordance with the Environmental Protection Authority (EPA) *Interim Construction Noise Guideline (ICNG), Road noise Policy (RNP)* and NSW *Industrial Noise Policy (INP)*.

Figure 1-1 North Cooranbong Concept Staging Plan



2 BACKGROUND

New residential development requires the co-ordinated provision of reticulated water and sewerage services. The provision of a LWC is the best alternative type of water treatment facility because the off-site impacts are limited; and because it is scalable and allows supply to increase in line with the anticipated residential development and the volume of waste to be treated. The Cooranbong LWC also makes a significant contribution to sustainability through the provision of recycled water back to the residential area.

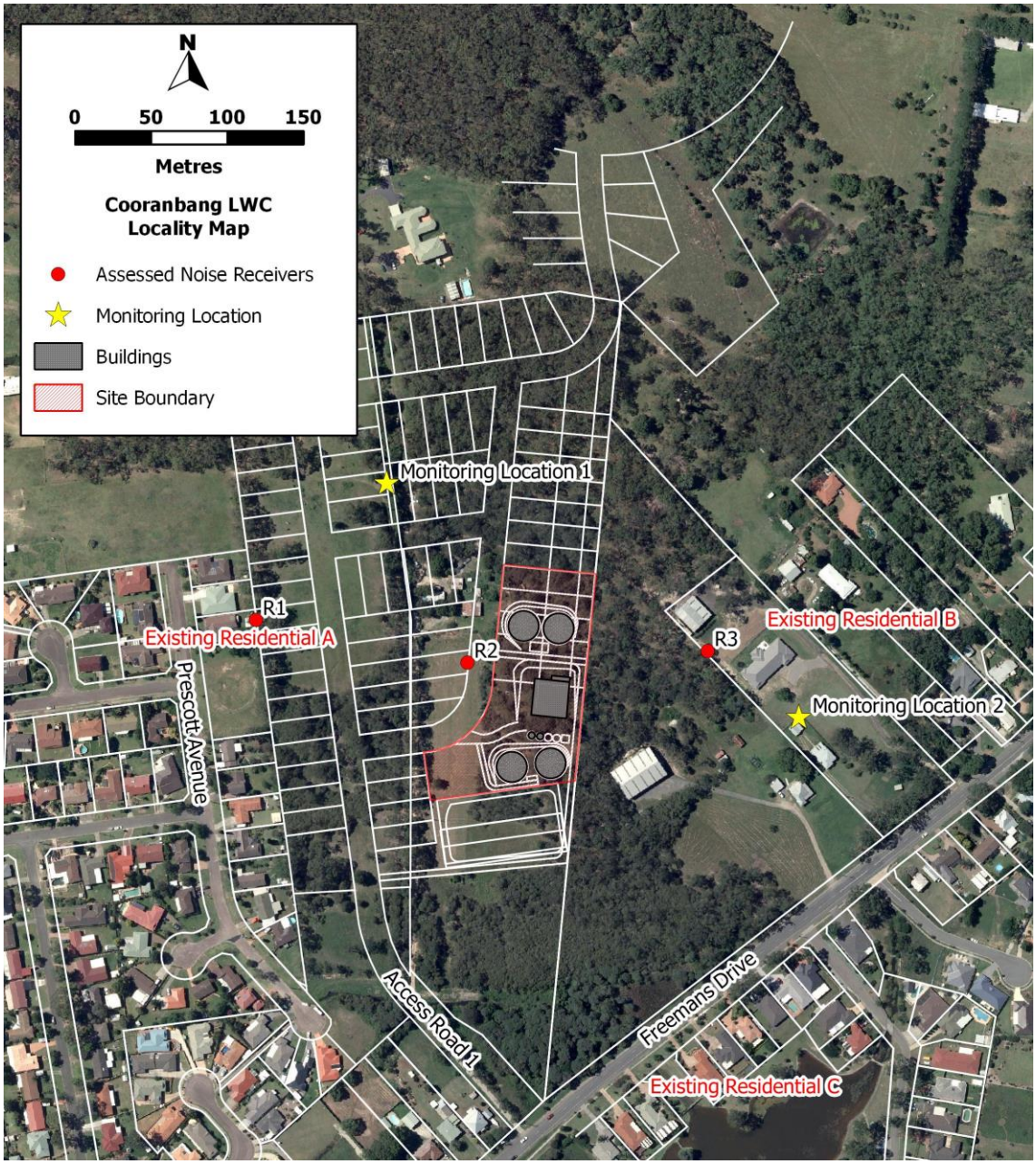
The alternative(s) to the proposed Cooranbong LWC is to build a traditional local sewage treatment plant with potential discharge to the local waterway, or more expensively to pipe the sewage to an existing sewage treatment plant for treatment and disposal, which would also require an amplification/upgrade of the existing receiving treatment plant. Either alternative would be more expensive, take longer to implement, have greater potential environmental impacts, and fail to achieve sustainability initiatives for water re-use.

3 SITE AND PROJECT DESCRIPTION

3.1 Surrounding Land Uses

The proposed location of the site is located upon part of Lot 12 DP 1158508, north of Freemans Drive. The land surrounding the site will facilitate a new residential community. The existing area is predominantly rural in nature. Existing residential areas or noise catchment areas (NCAs) are currently located approximately 150m to the west, 100m to the east and 180m to the south of the site. Figure 3-1 shows the subject area, noise monitoring location and the nearest existing and future residential areas. Locations R1 and R3 represent the nearest existing residential receivers and Location R2 represent the nearest future residential receiver.

Figure 3-1 Locality Map



3.2 Description of the Proposed Operation Works

The intended LWC will utilise sewage from the future residential area to produce high quality water. The sewage is treated at the LWC to provide recycled water plumbed into houses for non - drinking uses such as toilet flushing, washing machines, irrigation and car washing, thus reducing drinking water demand. The facility is intended to operate 24 hours, 7 days per week, housed in a low-scale, single level building within an open space setting. The intended capacity of the LWC is approximately 1,500kL per day, although the facility has been designed to achieve this benchmark over time in line with uptake in the residential area surrounding the development.

The operation of the LWC will be operated by Cooranbong Water on the following basis:

- the facility will operate 24 hours a day, 7 days per week;
- the recycled water, which is transported by pipe system back to customers; and
- any waste water screenings will be collected and disposed by way of an authorised waste disposal contractor.

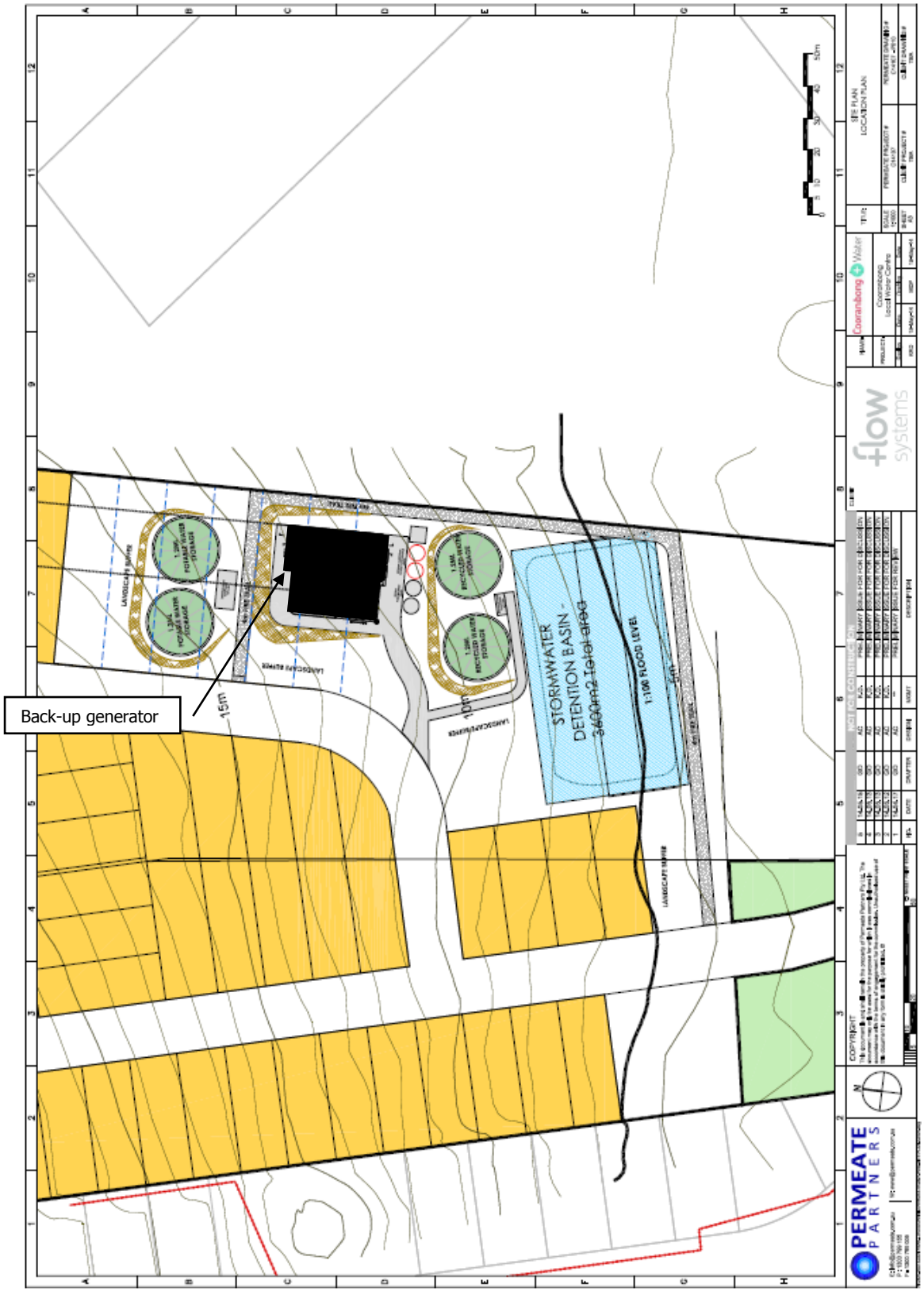
A concept layout for the LWC is shown in Figure 3-2. The following describes the LWC and its associated noise sources (equipment):

- An operations building will house plant and equipment involved in water treatment processes. The building is approximately 24m x 10m giving an overall area of 240m^2 with a skillion roof ranging from 3.6m to 6.1m height across its width. The building will have a mix of Colorbond and off-form concrete materials in natural and muted grey colours in its facades, and dressed with narrow bands of glass windows to soften the elevations. The south elevation will carry a roller door for access to the facility as well as a single door access from operations to delivery area. The north elevation will carry the entry doors to operations and an acoustic aluminium louvred door to blowers and compressors room. The roof will also be of Colorbond material. An air-conditioning unit will be used for conditioning the Control room.
- Aligned with the operations building, will be the treatment tanks, approximately 28m x 13m (364m^2) and approximately 5m in height. It will be constructed of off-form concrete panels in natural colours. A staircase located at the north of the building will provide access to the roof of the structure for servicing purposes. Located near the northern face of the building is a back-up generator, sitting externally to the building beneath the access staircase, which will provided power to the facility in the event that primary power supply becomes insufficient. The generator will be surrounded by a block wall up to 1m above the height of the generator. The facility buildings will contain plant items including membrane drain pump, WAS pump, permeate pumps, membrane blowers, process blowers, compressors and WAS dewatering.
- Two drinking water storage tanks are located in the northern part of the site. A further two tanks to store recycled water are located to the southern part of the site. Capacity is approximately 1.2 million litres each, and will stand approximately 4m high above ground level, and approximately 20m diameter. The tanks will be constructed of steel and sit in a compacted earth and gravel area.

The tanks will be interconnected with pipes and pumps and the like to each other, and to the treatment plant building. Pumps for drinking water and recycled water tanks are to be housed

in sheds of Colorbond material for weather and acoustic screening.

Figure 3-2 Site Layout Plan (Reference No. C14107 – P010)



Once the facility is fully operational, truck movements will be limited to chemical deliveries and is estimated at one to three trucks per month. Operator(s) will visit the site 2-3 times per week in standard utilities or passenger vehicles. Solid waste disposal will be managed through the connection to Hunter Water's sewerage network and agreement with Hunter Water. If this agreement is not reached with Hunter Water, up to an additional 3 trucks per week will be required to collect the solid waste bins.

3.3 Outline of Construction Works

To enable the operation of the proposed, the construction work on the interim facility (interim flow balance tanks) will commence once the network operators licence is granted which is anticipated for early 2015. The interim facility will be constructed by first clearing and grubbing the site for the facility and the access road from Road 1. The land will be generally contoured to the required bulk earthworks design. A temporary hardstand area will be built for the interim flow balance tanks and temporary access road.

The Cooranbong LWC will then be constructed once detailed designs are complete and a suitable quantity of sewage is available for commissioning of the facility. It is anticipated that construction, equipping and commissioning will take approximately 12 months to complete.

The construction of the Cooranbong LWC will commence with detailed excavation and installation of underslab pipework and conduits followed by traditional form, reinforcement and pouring of concrete floors and walls. The concrete tanks will be hydraulically tested and the building finished with architectural finishes. The steel storage tanks will be constructed on concrete ring beam foundations.Spoil from the construction of the Cooranbong LWC is expected to be minimal and will be managed in accordance with a Construction Environmental Management Plan (CEMP) for the proposal. It is likely that all spoil will be used for re-contouring of the land surrounding the building and facilities.

Once the building and tanks are substantially complete, it will be equipped with mechanical, electrical and control equipment including pumps, mixers, inlet screens, odour control unit, membranes, UV disinfection and chemical dosing tanks.

3.3.1 Construction Hours

The Cooranbong LWC will be constructed during the following hours:

- Monday to Friday 7am to 6pm; and
- Sunday 8am to 1pm.

No construction work is proposed to be undertaken on Saturdays or Public Holidays. Deliveries will not be received on Saturdays or Sundays however construction works are proposed on Sundays.

3.3.2 Construction Plant and Equipment

The following plant and equipment would be required to undertake the proposed works:

- Front end loader / Chainsaws / Mulcher;
- Small tipper trucks;
- Rigid and articulated delivery trucks;
- Excavator;
- Concrete trucks;
- Cranes;
- Grader;
- Portable generators;
- Scaffold;
- Elevated work platforms; and
- General construction / building tools.

3.3.3 Construction Traffic

Vehicle movements during construction will mostly consist of the floating of earthmoving equipment and concrete agitator trucks delivering concrete during scheduled pours. Concrete truck movements will occur at various stages throughout the construction period and will peak at around eight concrete trucks per day at the peak of the construction. In addition, there will be an average of two truck movements per day for the delivery of other plant, materials and equipment.

4 EXISTING NOISE ENVIRONMENT

Unattended noise monitoring was conducted at the following locations as shown in Figure 3-1:

- Monitoring Location 1 - at the north-western boundary of Lot 12 DP 1158508 between Friday 2 May and Monday 12 May 2014 ;
- Monitoring Location 2 - at the back yard of 651A Freemans Drive between Friday 2 May and Sunday 4 May 2014.

The noise monitoring equipment used for the unattended measurements consisted of an ARL-NGARA Environmental Noise Logger set to A-Weighted, Fast response continuously monitoring over 100ms sampling periods. This equipment is capable of remotely monitoring and storing noise level descriptors for later detailed analysis. The equipment calibration was checked before and after the survey and no significant drift occurred.

The logger determines L_{A1}, L_{A10}, L_{A90} and L_{Aeq} levels of the ambient noise. The L_{A1}, L_{A10} and L_{A90} levels are the levels exceeded for 1%, 10% and 90% of the sample time respectively (See Appendix A for further explanations). The L_{A1} is indicative of maximum noise levels due to individual noise events such as the occasional passby of a heavy vehicle. This is used for the assessment of sleep disturbance. The L_{A90} level is normally taken as the background noise level during the relevant period. The L_{Aeq} level is the Equivalent Continuous Sound Level and has the same sound energy over the sampling period as the actual noise environment with its fluctuating sound levels. The L_{Aeq} is used for the assessment of operational noise and traffic noise. The L_{A10} is used for the assessment of construction noise.

The detailed measurement results are shown in graphical format in Appendix A. Note that the noise logger at 651A Freemans Drive failed to collect data for a period of 7-days due to battery failure, only two days of data were measured. A review of the measured L_{A90} in Appendix A indicates the Rating Background Levels (RBLs) at both locations are identical during the more stringent evening and night time periods, while daytime L_{A90} are generally higher at 651A Freemans Drive as a result of road traffic noise. For this reason, it is considered that the measured RBLs at the western boundary of Lot 12 DP 1158508 are valid for use at both locations.

The measured RBLs at the western boundary of Lot 12 DP are shown in Table 4-1. The RBLs for the standard periods of daytime, evening and night time are presented.

Table 4-1 Measured Rating Background Noise Levels (dBA)

Location	Day (7am-6pm)	Evening (6pm-10pm)	Night (10pm-7am)
Monitoring Location 1 - north-western boundary of Lot 12 DP 1158508	37	36	32

5 ROAD TRAFFIC NOISE ASSESSMENT

5.1 Relevant Road Traffic Noise Criteria

Whilst there are no criteria which relate to temporary changes in traffic noise during construction periods, it is desirable that noise associated with truck deliveries to the site comply with the criteria shown in the NSW *Road Noise Policy (RNP)* published by EPA in March 2011. The main roads affected by heavy vehicle movements will be Freemans Drive which is a sub-arterial road) and the proposed access road Road 1 which is a local road. On this basis, the traffic noise criteria have been taken from the *RNP* and are shown in Table 5-1.

Table 5-1 Road Noise Criteria

Road Category	Type of Project / Land Use	Assessment Criteria - dBA	
		Day (7am – 10pm)	Night (10pm – 7am)
Local Roads	Existing residences affected by additional traffic on existing local roads generated by land use developments	$L_{Aeq,1hr}$ 55 (external)	$L_{Aeq,1hr}$ 50 (external)
Sub-Arterial Roads	Existing residences affected by additional traffic on existing freeways/ arterial / sub-arterial roads generated by land use developments	$L_{Aeq,15hr}$ 60 (external)	$L_{Aeq,9hr}$ 55 (external)

A review of the road noise criteria in Table 5-1 indicates that the applicable criteria are $L_{Aeq,1hr}$ of 55dBA for local roads (Access Road 1) and $L_{Aeq,15hr}$ of 60dBA for sub-arterial roads (Freemans Drive).

5.2 Road Traffic Noise Assessment

Road traffic noise has been calculated for heavy vehicle movements to the site and existing traffic movements have been ignored. The anticipated peak movements per day is five concrete trucks per day at the peak of the construction. Typically, there will be an average of two truck movements per day for the delivery of other plant, materials and equipment. Based on this information the following noise levels have been calculated:

- Access Road 1 (new local road) – $L_{Aeq,1hr}$ of 51dBA at the façade of the nearest noise sensitive receiver (approximately 13m from the road). This is based on 1 movement per hour; and
- Freemans Drive (existing sub-arterial road) - $L_{Aeq,15hr}$ of 49dBA at the façade of the nearest noise sensitive receiver (approximately 17m from the road). This is based on 5 movements per day.

The predicted road traffic noise levels above are well within the *RNP* criteria. Therefore, noise impacts would be minimal. Note that whilst these levels are below the criteria, there will be a substantial change in traffic pattern on Access Road 1 during the construction works.

6 CONSTRUCTION NOISE & VIBRATION ASSESSMENT

6.1 Construction Noise & Vibration Criteria

The following sections detail the applicable site-specific noise and vibration criteria based on the guidelines from EPA, being the *Interim Construction Noise Guideline* and *Assessing Vibration: A Technical Guideline*.

6.1.1 Construction Noise Management Levels (NML's)

The EPA released the "*Interim Construction Noise Guideline*" *(CNG)* in July 2009. The guideline provides noise goals that assist in assessing the impact of construction noise.

For residences, the basic daytime construction noise goal is that the $L_{Aeq,\ 15min}$ noise management level should not exceed the background noise by more than 10dBA. This is for standard hours: Monday to Friday 7.00am-6.00pm, and Saturday 8.00am-1.00pm. Outside the standard hours, where construction is justified, the noise management level would be background + 5dBA. Table 6-1 details the *ICNG* noise management levels and its application.

Table 6-1 Construction Noise Management Levels at Residences using Quantitative Assessment

Time of Day	Management Level $L_{Aeq,15min}$ (dBA)	How to Apply
Recommended Standard Hours: Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or Public Holidays	Noise affected RBL + 10dBA	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq,(15min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to minimise noise. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75dBA	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the proponent should consider very carefully if there is any other feasible and reasonable way to reduce noise to below this level. If no quieter work method is feasible and reasonable, and the works proceed, the proponent should communicate with the impacted residents by clearly explaining the duration and noise level of the works, and by describing any respite periods that will be provided.

Time of Day	Management Level $L_{Aeq,15min}$ (dBA)	How to Apply
Outside recommended standard hours	Noise affected RBL + 5 dB	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5dB(A) above the noise affected level, the proponent should negotiate with the community. For guidance on negotiating agreements see section 7.2.2.

Typically no works should be undertaken on Sundays. In the case of this project, no works are proposed to be undertaken on Saturdays to accommodate the surrounding community. Accordingly, Saturdays' construction works have been scheduled to occur on Sundays. Note that JPG has indicated that the amended construction hours have been accepted by Lake Macquarie City Council in the Cooranbong area.

Typical background noise levels in the area surrounding the construction site have been measured and were reported in Section 4 of this report and in Appendix A. Based on these levels, the following applicable noise management levels (NML's) for construction activities at surrounding residential receivers have been adopted:

- Monday-Friday (typical 7am-6pm) $L_{Aeq,15min}$ 47 (37+10) dBA
- Sunday (out-of-hours until 1pm) $L_{Aeq,15min}$ 42 (37+5) dBA
- Highly noise affected $L_{Aeq,15min}$ 75 dBA

6.1.2 Site Vibration Criteria

Typically, vibration impacts are determined using following documents:

- Building damage – German Standard DIN 4150: Part 3 – 1999 *Structural vibration in buildings: Effects on structures*. Since vibration in the frequency band below 10Hz is not expected, the limit at the residential foundation would be 5mm/s peak component particle velocity (pcpv); and
- Human comfort – *Environmental noise management assessing vibration: A technical guide* (DEC, 2006). Since vibration from the construction site below 8Hz is not expected, the comfort limit becomes 0.4mm/s rms vertical vibration.

However, as the distance from vibration intensive plant to the nearest residential receiver is considered to be large (approximately 70m), ground vibration at surrounding residential receivers would be low. On this basis, the recommended safe working distances for vibration intensive plant suggested in the Transport Construction Authority's *Construction Noise Strategy* (2012) have been adopted in this assessment to evaluate the vibration impacts. Table 6-2 sets out the recommended safe working distances for various vibration intensive plant.

Table 6-2 Recommended Safe Working Distances for Vibration Intensive Plant

Item	Description	Safe working Distance	
		Cosmetic Damage	Human Response
Small Hydraulic Hammer	(300 kg – 5 to 12t excavator)	2m	7m
Medium Hydraulic Hammer	(900 kg – 12 to 18t excavator)	7m	23m
Pile Boring	≤ 800 mm	2m (nominal)	N/A
Jackhammer	Hand held	1m (nominal)	Avoid contact with structure

- Construction Noise Strategy, 2012, Transportation Construction Authority

A review of the information in Table 6-2 indicates that the human comfort vibration impacts at surrounding residences would be minimal when using rock breakers. Furthermore, structural damage vibration criteria in residential buildings are much higher than human comfort criteria, and the nearest residential receiver is situated far enough for impacts to be minimal in all circumstances. Therefore, no further vibration consideration is required.

6.2 Construction Equipment and Noise Source Levels

Sound Power Levels (SWLs) for typical construction plant are detailed in Table 6-3. These SWLs have been measured at other similar construction sites. The table provides both Sound Power Level and Sound Pressure Levels (SPL) at 7m for the equipment. Sound Power Level is independent of measurement position.

Table 6-3 Typical Construction Plant Sound Levels (dBA)

Plant	Sound Power Level	Sound Pressure Level at 7m
Concrete Truck	105	80
Concrete Pump – 120 mm diameter / 50 bar	103	78
Concrete Saw	116	91
50t Crane	105	80
Dump Truck	108	83
Compressor	100	75
Bobcat	103	78
Generator and Power Hand Tools	105	80
D10 Bulldozer	114	89
15t Excavator	103	83
40t Excavator	110	90
Crawler Cranes	98	73
16H Grader	108	83
Front End Loader	112	87
Hammer Hydraulic	122	97
Wood Chipper	117	102

6.3 Predicted Construction Noise Levels

Calculation of likely construction noise at surrounding receivers has been undertaken for the proposed construction works.

Site-related noise emissions were modeled with the "CadnaA" noise prediction software using the ISO 9613 noise prediction algorithms. Factors that are addressed in the noise model are:

- equipment sound level emissions and location;
- screening effects from barriers;
- receiver locations;
- ground topography;
- noise attenuation due to geometric spreading;
- ground absorption; and
- atmospheric absorption.

Noise predictions have been made based on the possible worst-case impacts taking into consideration the most likely construction scenarios. This has been made based on WM's previous experience with similar scale construction projects. As a worst-case scenario, this assumes that most of the relevant plant would be operating during most of the 15-minute assessment period. The following have been assumed for each of the noise significant scenarios:

- Site Clearing/Grubbing

  Noisiest activity in this scenario would be from the use of front end loader to clear land while the excavator feed logs into the wood chipper. $L_{Aeq,15min}$ noise level for this activity would be 115dBA.

- Bulk Earthworks

  Noisiest activity in this scenario would be from excavation works carried out by a 15t excavator, tipper trucks and articulated trucks working at the same time. $L_{Aeq,15min}$ noise level for this activity would be 113dBA.

- Foundation Construction

  Noisiest activity in this scenario would be from the pouring of concrete floors and walls. This would be carried out by a concrete agitator truck idling on site and a concrete pump transferring liquid concrete to the designated areas. $L_{Aeq,15min}$ noise level for this activity would be 107dBA.

- Superstructure Construction

  Noisiest activity in this scenario would be from the steel cage installation that would involve lifting of heavy loads using a 50t crane, an 8 wheel crane truck with delivery truck idling on site. $L_{Aeq,15min}$ noise level for this activity would be 108dBA.

- General Construction / Scaffolding

  Noisiest activity in this scenario would be from the use of power hand tools. $L_{Aeq,15min}$ noise level for this activity would be 105dBA

Some specific control measures, which are referred to in Sections 6.5 and 6.6 below, have been considered necessary for the site and these have been included in the prediction of noise levels.

There are a number of stages of the work proposed and some stages will be noisier than others. Table 6-4 shows the predicted noise levels at each of the NCAs for the noise significant stages of the work during normal construction hours.

Table 6-4 Predicted Construction Noise Levels at Residence – $L_{Aeq,15\ min}$ (dBA)

NCA	Predicted Noise Level	Weekday NML	Exceedance	Sunday NML*	Exceedance
Scenario – Site Clearing and Grubbing					
A	65	47	18	42	23
B	64	47	17	42	22
C	61	47	14	42	19
Scenario – Bulk Earthworks					
A	63	47	16	42	21
B	62	47	15	42	20
C	59	47	12	42	17
Scenario – Foundation Construction					
A	57	47	10	42	15
B	56	47	9	42	14
C	53	47	6	42	11
Scenario – Superstructure Construction					
A	58	47	11	42	16
B	57	47	10	42	15
C	54	47	7	42	12
Scenario – General Construction					
A	55	47	8	42	13
B	54	47	7	42	2
C	51	47	4	42	9

A review of results in Table 6-4 indicates the following:

- Exceedances of up to 18 dB (during recommended standard hours) at residences to the west of the site are expected during site clearing and bulk earthworks period. The predicted exceedances are due to the operation of a wood chipper and a combination of mobile plant items such as excavator and trucks. This magnitude of exceedance is consistent with similar sites where residences overlook development sites.
- During the structure stage the magnitude of exceedance will decrease due to the nature of construction activities. Fit-out works are less noise intensive and this would result in general compliance at residences during this stage (not shown in Table 6-4).
- Greater exceedances are predicted on Sunday due to more stringent noise management levels that are triggered by the proposed extended hours of operation on this day. It is noted that all predicted noise levels are below the "highly noise affected" noise objective.

Based on these findings the adoption of reasonable and feasible noise management and mitigation will be required. These measures should be determined in detail when a contractor, with defined construction techniques, has been engaged on the project. However, "in-principle" mitigation measures are detailed in Section 6.4 and Section 6.5.

6.4 Construction Noise Mitigation Measures

Without mitigation, noise levels from construction activities have been predicted to exceed the noise management levels nominated in the guidelines at some surrounding receivers. Therefore, noise control measures are recommended to ensure that noise is reduced where feasible.

The following project specific mitigation measures are recommended;

- Selection of quietest feasible construction equipment;
- Localised treatment such as barriers, shrouds and the like around fixed plant such as pumps, generators and concrete pumps; and
- Provision of respite periods.

In addition, the following measures should be included in a Noise and Vibration Management Plan to be prepared prior to issue of a construction certificate (CC):

- *Plant Noise Audit* – Noise emission levels of all critical items of mobile plant and equipment should be checked for compliance with noise limits appropriate to those items prior to the equipment going into regular service. To this end, testing should be established with the contractor;
- *Environmental Inductions* – It is important that an induction is provided to all site personnel with an emphasis on understanding and managing noise impacts;
- *Equipment Selection* – All fixed plant at the work sites should be appropriately selected, and where necessary, fitted with silencers, acoustical enclosures and other noise attenuation measures in order to ensure that the total noise emission from each work site complies with EPA guidelines;
- *Site Noise Planning* – Where practical, the layout and positioning of noise-producing plant and activities on each work site should be optimised to minimise noise emission levels; and
- Install a 2.4 metre type-A hoarding between the site and residences. This should be a minimum 17mm thick structural plywood or equivalent panel.

The adoptions of the above measures are aimed at working towards achieving the noise management levels established at surrounding receivers.

6.5 Community Liaison & General Approaches to Mitigation

An effective community relations programme should be put in place to keep the community that has been identified as being potentially affected appraised of progress of the works, and to forewarn potentially affected groups (e.g. by letterbox drop, meetings with surrounding owners/tenants, etc.) of any anticipated changes in noise and vibration emissions prior to critical stages of the works, and to explain complaint procedures and response mechanisms.

Close liaison should be maintained between the communities overlooking work sites and the parties associated with the construction works to provide effective feedback in regard to perceived emissions. In this manner, equipment selections and work activities can be coordinated where necessary to minimise disturbance to neighbouring communities, and to ensure prompt response to complaints, should they occur.

6.6 Noise & Vibration Management Plan

A Construction Noise and Vibration Management Plan for the site is recommended prior to issue of a CC. Areas that should be addressed in plan include:

- noise and vibration monitoring;
- response to complaints**;**
- responsibilities;
- monitoring of noise emissions from plant items;
- reporting and record keeping;
- non-compliance and corrective action; and
- Community consultation and complaint handling.

The plan should be developed by the successful contractor and be part of their Environmental Management Plan.

7 OPERATIONAL NOISE ASSESSMENT

7.1 Relevant Operational Noise Criteria

This section of the report discusses noise guidelines and criteria for the assessment of operational noise. Appropriate criteria are contained within the NSW Environmental Protection Authority (EPA) *NSW Industrial Noise Policy (INP).*

7.1.1 Industrial Noise Policy

The *INP* is designed to assess noise using the more stringent of the following two approaches:

- Intrusive noise impacts in the short term for residences; and
- Amenity for particular land uses such as residences.

The *INP's* intrusive noise goal is the noise level 5dBA above the background noise level for each time period (daytime, evening or night time) of interest. The background noise level is derived from the measured L_{A90} noise levels.

The amenity goal sets an upper limit to the total industrial noise level ($L_{Aeq,period}$) in an area from all industrial noise sources (existing and future). The criterion depends on the time of day, area classifications and the relationship of the total measured $L_{Aeq,period}$ (and contribution from existing industrial noise) to determine the Acceptable Noise Level (ANL) for the development. Traffic noise would also be taken into account in areas where the noise environment is significantly affected by traffic noise.

The potentially affected area will be rural-residential. Given this, the acceptable amenity noise levels ($L_{Aeq,period}$ dBA) which apply over the whole day, evening or night period are as follows and are applicable only to noise from industrial sources:

- Daytime 55dBA
- Evening 45dBA
- Night time 40dBA

In summary, the overall industrial noise from all industrial noise sources in the area (including the subject development) should not exceed the above amenity noise levels over the day evening and night periods.

Furthermore, the *INP* also suggests some sources may cause less annoyance where only a single event occurs for a limited duration, such as the back-up generator where it does not usually operate and will be tested in operation during daytime hours either once per month for 30 min, or once every 2 months for 1 hour. The adjustment for duration is presented below in Table 7-1. This applies where a single noise-event noise is continuous for a period of less than two and a half hours in any 24-hour period. The acceptable noise level may be increased by the adjustment as shown in Table 7-1 on the following page. This adjustment is designed to account for unusual and one-off events, and does not apply to regular high-noise levels that occur more frequently than once per day.

Table 7-1 Adjustments for Duration (dBA)

Duration of noise (one event in any 24 hour period)	Increase in acceptable noise level at receptor	
	Daytime and evening (0700-2200 h)	Night-time (2200-0700 h)
1.0 to 2.5 hours	2	Nil
15 minutes to 1 hour	5	Nil
6 minutes to 15 minutes	7	2
1.5 minutes to 6 minutes	15	5
Less than 1.5 minutes	20	10

7.1.2 Project Specific Criteria

Both amenity and intrusiveness criteria are adopted for this assessment. Table 7-2 presents a summary of the noise criteria for the existing residential receivers surrounding the proposed site using the measured RBL values presented in Table 4-1.

Table 7-2 Project Specific Criteria (dBA)

Time Period[1]	Intrusiveness Criterion $L_{Aeq,15min}$	Amenity Criterion $L_{Aeq,period}$
Daytime	**42**	55
Evening	**41**	45
Night time	**37**	40

Note: 1) Daytime 7.00am–6.00am; Evening 6.00pm–10.00pm; Night 10.00pm-7.00am
2) Noise criteria applicable to this assessment are highlighted in bold

Since the noise will be constant and not varying in level, the lower criterion for each period will apply, as highlighted in the table.

As the back-up generator does not usually operate and will be tested in operation during daytime hours either once per month for 30 min, or once every 2 months for 1 hour, a positive adjustment of 5dB will apply to the daytime acceptable level of 42 dBA. The adjusted daytime acceptable level is 47dBA L_{Aeq}.

7.2 Calculation Method

Noise levels were calculated using the Cadna A 4.6 computer modelling program based on ISO 9613 algorithms. Using Cadna A it is possible to build a model of the facility noise sources and the surrounding area. The model is capable of taking account of the following parameters:

- noise source levels;
- topography between the facility and the residences;
- any shielding by buildings between noise sources and receivers; and

- meteorological effects which could change noise propagation.

Because the Facility is well within 300m of the nearest proposed residences, meteorological enhancement of noise propagation are not significant and have not been considered in the assessment.

Noise source levels used in this assessment were provided by Permeate Partners Pty Ltd unless otherwise indicated. The noise source levels are summarised in Table 7-3.

Table 7-3 Noise Source Levels

Description	Qty	Sound Pressure Level at 1m
Backup Generator	1 x duty	81dBA each
Membrane tank drain pump	1 x duty	75dBA each
WAS pump	1 x duty	72dBA each
Permeate pump	1 x duty / 1 x standby	75dBA each
Membrane blower	1 x duty / 1 x standby	75dBA each
Process blower	2 x duty / 1 x standby	75dBA each
Compressor	1 x duty / 1 x standby	65dBA each
WAS Dewatering	1 x duty	72dBA each
Drinking water distribution pumps	2 x duty / 1 x standby	75dBA each
Recycled water distribution pumps	2 x duty / 1 x standby	75dBA each
6hp Air-Con Unit (Wilkinson Murray database)	1 x duty	64dBA each

Based on the noise source levels in Table 7-3 the reverberant noise levels inside the equipment room was calculated to be 86dBA and 82dBA inside the sheds enclosing drinking/recycled water distribution pumps.

Sheds enclosing drinking water distribution pumps and recycled water distribution pumps are assumed to be constructed from Colorbond to be consistent with the equipment building and control room.

Noise emission from the site were calculated to the nearest residential properties and are presented in Section 7.3 and Section 7.4.

7.3 Noise Emission Levels – All Equipment (Excluding Back-Up Generator)

The results of the modelling for all equipment operating (excluding back-up generator) are presented in Table 7-4. This is also presented in graphical form as noise contour map in Appendix B.

Table 7-4 Predicted $L_{Aeq,15min}$ Noise Levels At Residences (Existing and Future) With All Equipment Operating Excluding Back-Up Generator - dBA

Scenario	Criteria Day/ Evening/ Night (dBA)	R1 $L_{Aeq,15min}$ (dBA)	R2 $L_{Aeq,15min}$ (dBA)	R3 $L_{Aeq,15min}$ (dBA)
Without Specific Noise Mitigation	42/ 41/ 37	22	34	23

When all plant, excluding back-up generator, are operating, the predicted noise levels comply with the limiting 37dBA night time noise criterion at the nearest existing residential receivers and new residential receivers. Therefore, no further acoustic consideration is required.

7.4 Noise Emission Levels – With Back-Up Generator

The generator will be surrounded by a block wall up to 1m above the height of the generator.

The predicted noise levels when the back-up generator is in operation are presented in Table 7-5. This is also presented in graphical form as noise contour map in Appendix B.

Note that as the back-up generator does not usually operate and will be tested in operation during daytime hours either once per month for 30 min, or once every 2 months for 1 hour, a positive adjustment of 5dB will apply to the daytime acceptable level of 42 dBA.

Table 7-5 Predicted $L_{Aeq,15min}$ Noise Levels At Residences (Existing and Future) With Back-Up Generator - dBA

Scenario	Adjusted Daytime Intrusive Criterion (dBA)	R1 $L_{Aeq,15min}$ (dBA)	R2 $L_{Aeq,15min}$ (dBA)	R3 $L_{Aeq,15min}$ (dBA)
Without Specific Noise Mitigation	47 (42+5)	27	38	28

A review of the predicted noise levels from all noise sources with the back-up generator in Table 7-5 indicates compliance with the adjusted daytime acceptable noise level of 47dBA at the nearest existing residential receivers and new residential receivers. Therefore, no further acoustic consideration is required.

7.5 Tonality of Noise

There is some potential that the noise may be tonal in character. According to the *INP*, a modification factor of 5dBA should be added to account for the higher intrusiveness of the noise in such circumstances. Should a 5dBA modification factor be applicable, noise emission from site could exceed the night time criterion of 37dBA at the nearest new residential receivers. It is therefore recommended that equipment with tonal characteristic are to be avoided at the procurement stage.

8 CONCLUSION

A construction and operational noise/vibration assessment of the proposed Cooranbong Local Water Centre within the North Cooranbong Residential Precinct has been conducted. Site-specific noise criteria that are applicable to this entire project have been established and presented. The criteria have been determined for surrounding receivers to be applied on all state significant development applications.

8.1 Construction Stage

A construction noise assessment has been conducted for the proposed construction activities associated with the proposed LWC to determine the potential for noise and vibration impact at surrounding receivers where exceedances of noise management levels nominated in the *Interim Construction Noise Guideline* may be expected at times at surrounding receivers.

Vibration associated with on-site construction activities has low potential to impact on receivers surrounding the site. Furthermore, road traffic noise associated with heavy vehicle movements (such as delivery of equipment, materials and concrete, etc.) on adjacent roads also has minimal impact on receivers surrounding the site.

Accordingly, management of noise from construction activities is recommended to be included in the Site Construction Environmental Management Plan prepared by the successful contractor.

8.2 Operational Stage

Operational noise associated with the proposed blowers and compressors room, recycled water pumps, drinking water pumps and back-up generator located at the proposed LWC has been assessed against noise criteria set out in the EPA's *Industrial Noise Policy*.

Predicted noise levels from the proposed blowers and compressors room, recycled water pumps and drinking water pumps indicate compliance with all criteria on all occasions at the closest identified noise sensitive locations (both existing and future).

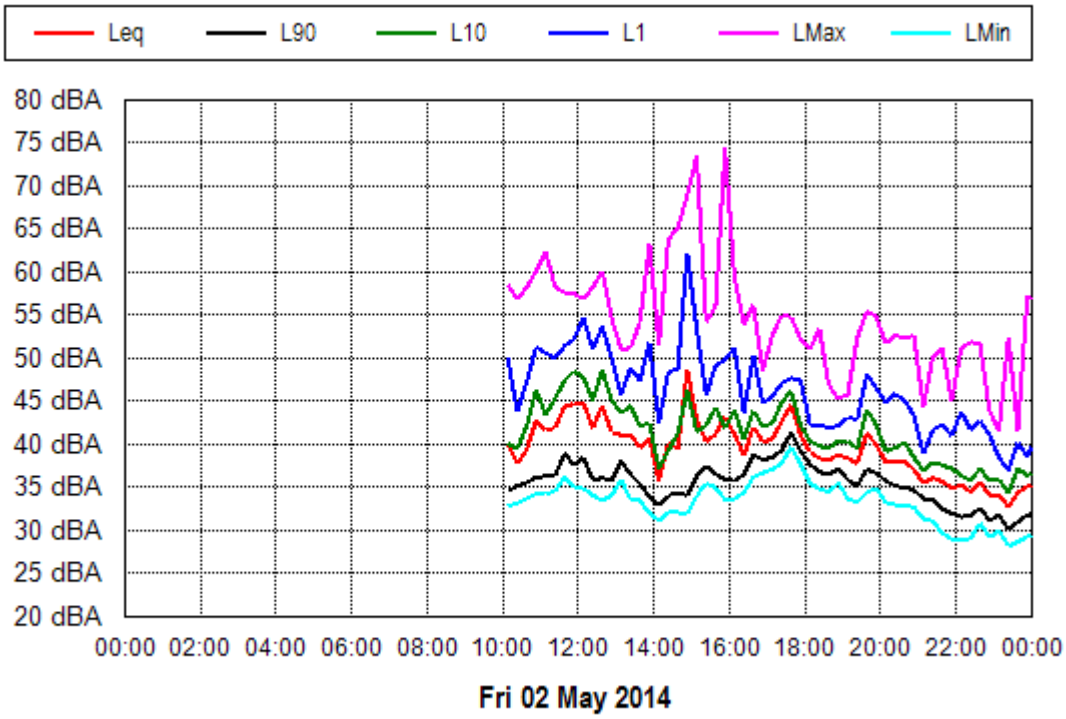
Predicted noise level from the back-up generator also indicated compliance with the adjusted intrusive daytime noise level at the closest identified noise sensitive locations (both existing and future).

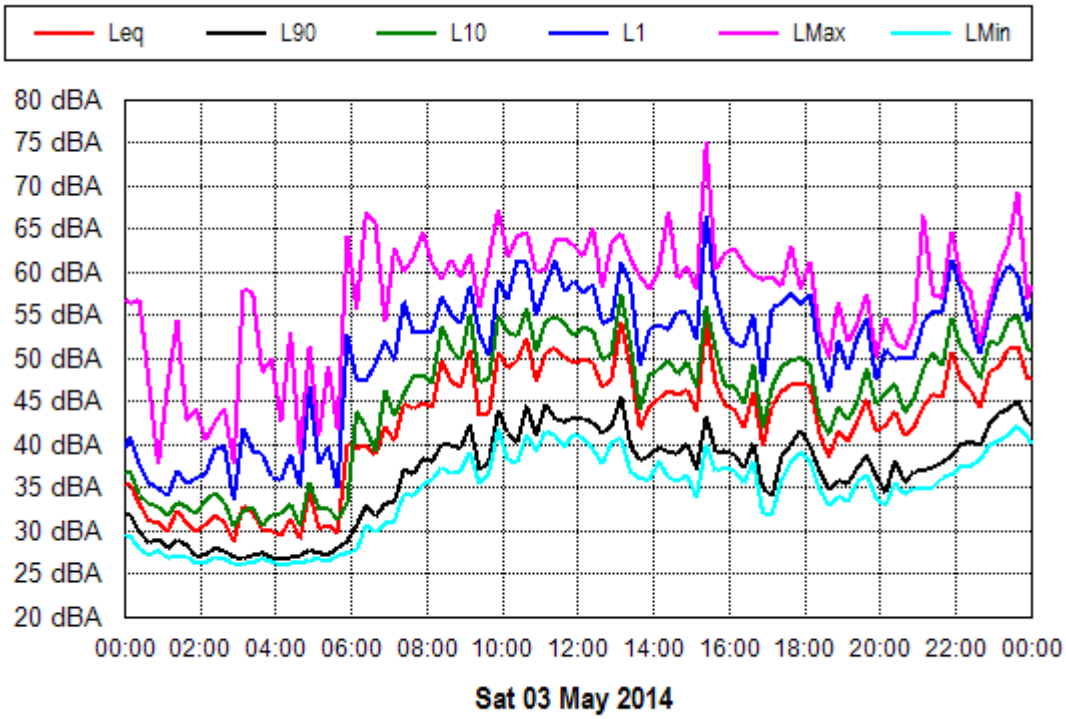
Note that there is some potential that the noise may be tonal in character. Therefore, it is recommended that equipment with tonal characteristics are to be avoided at the procurement stage.

APPENDIX A

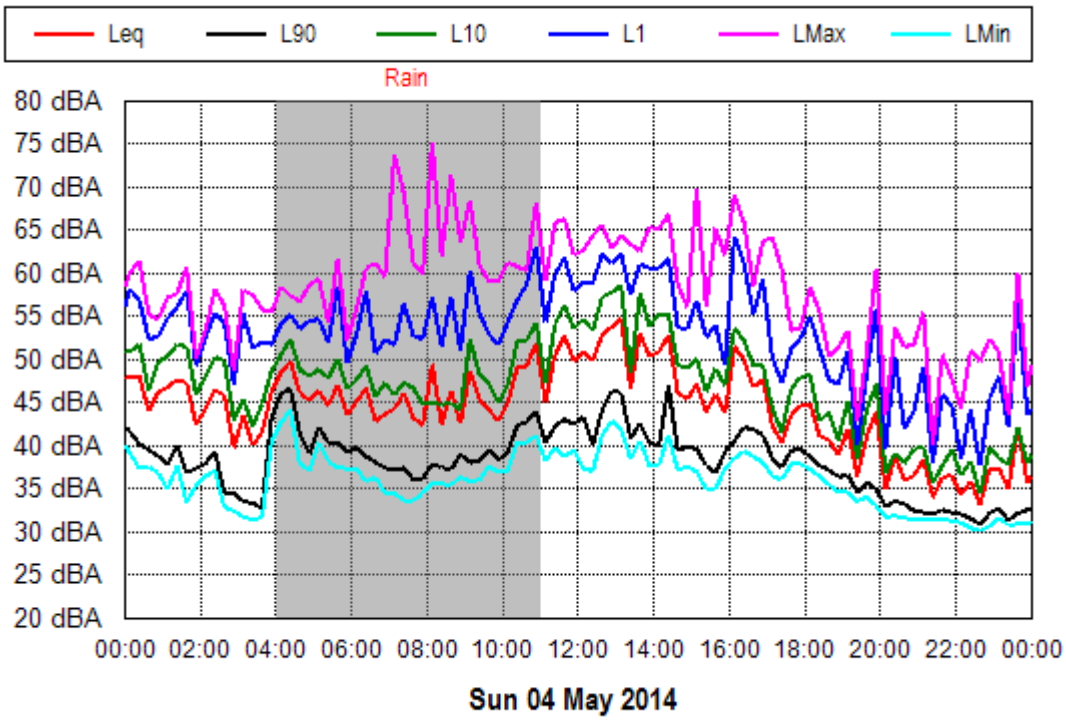
NOISE MEASUREMENT RESULTS

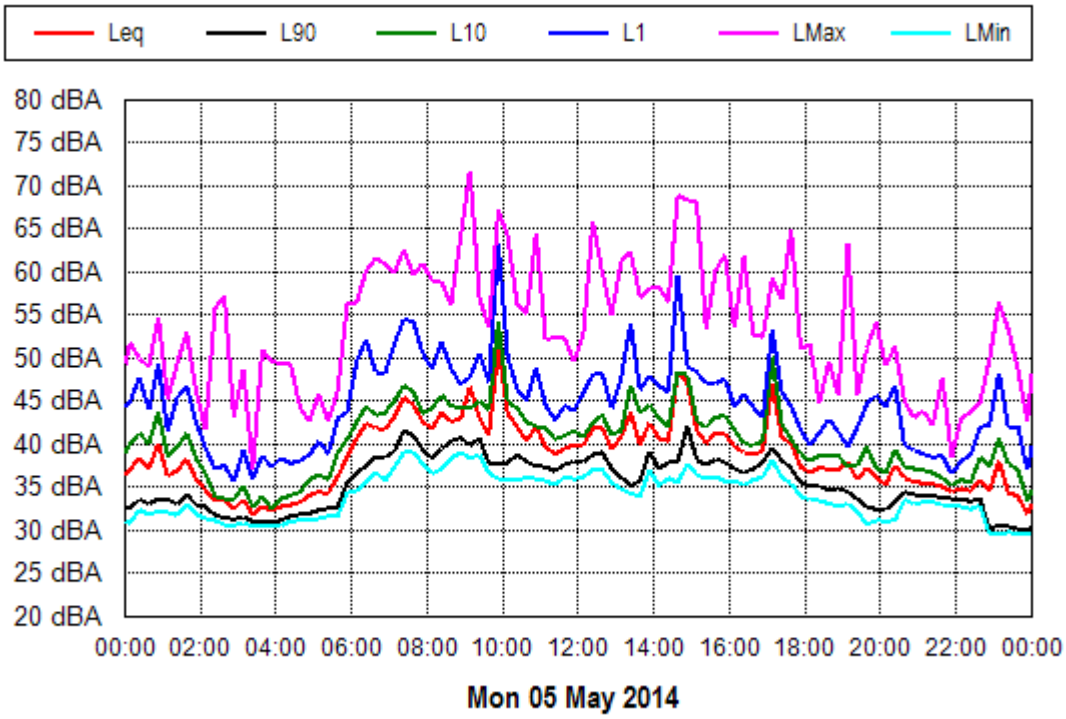
Monitoring Location 1: North-western boundary of Lot 12 DP 1158508



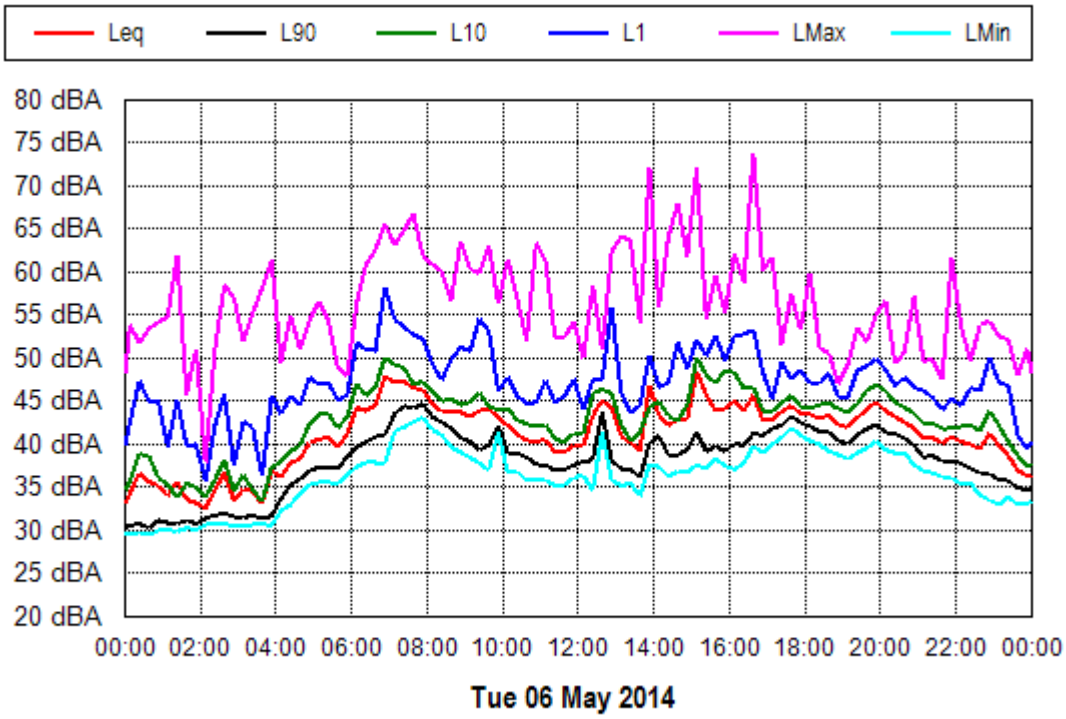


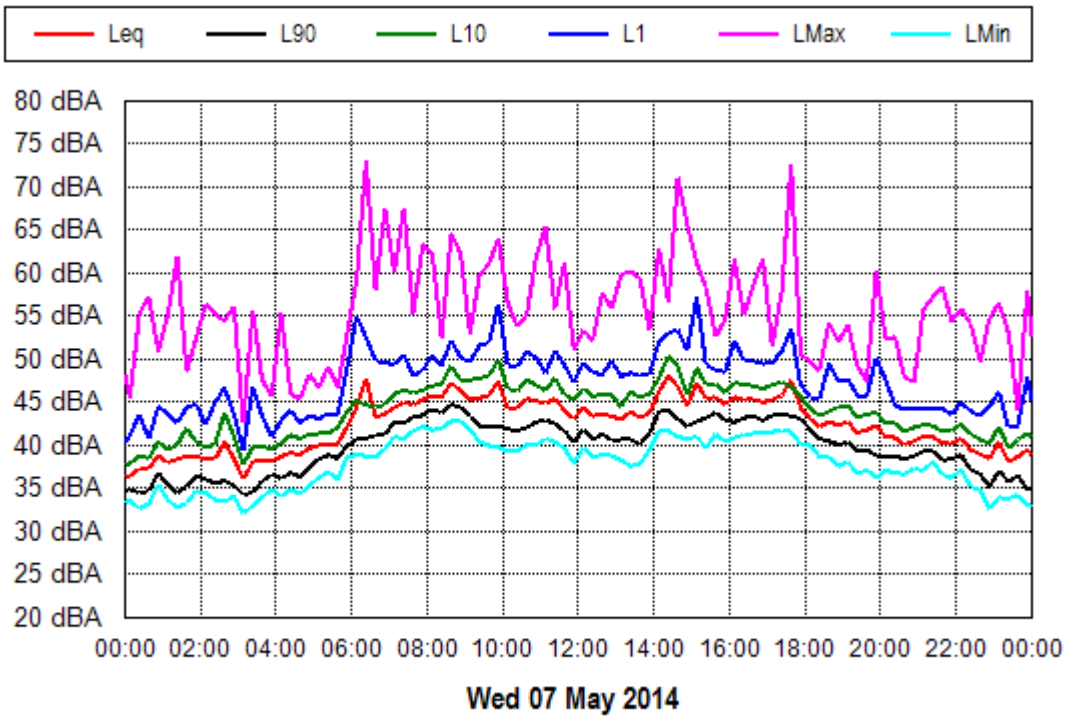
Monitoring Location 1: North-western boundary of Lot 12 DP 1158508



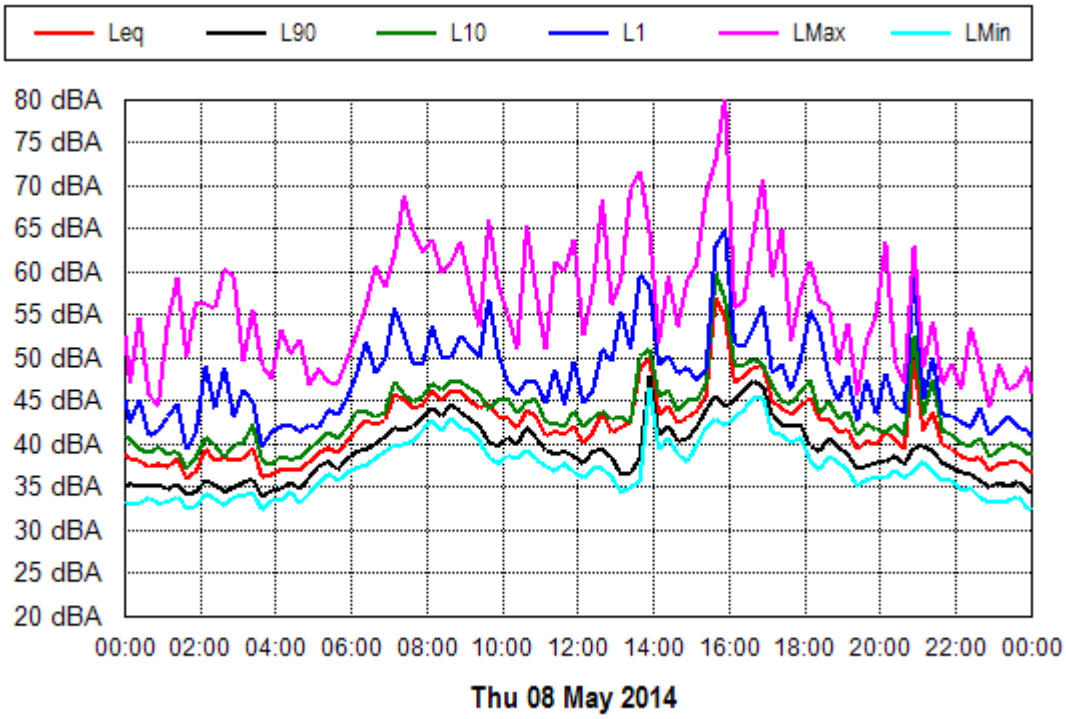


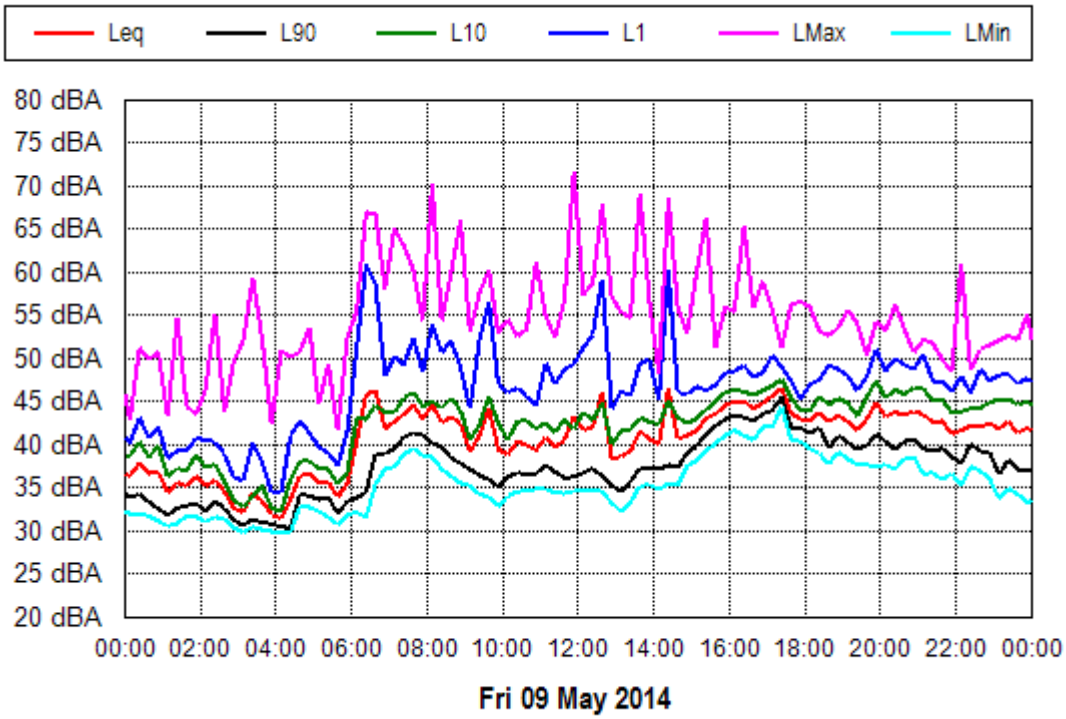
Monitoring Location 1: North-western boundary of Lot 12 DP 1158508



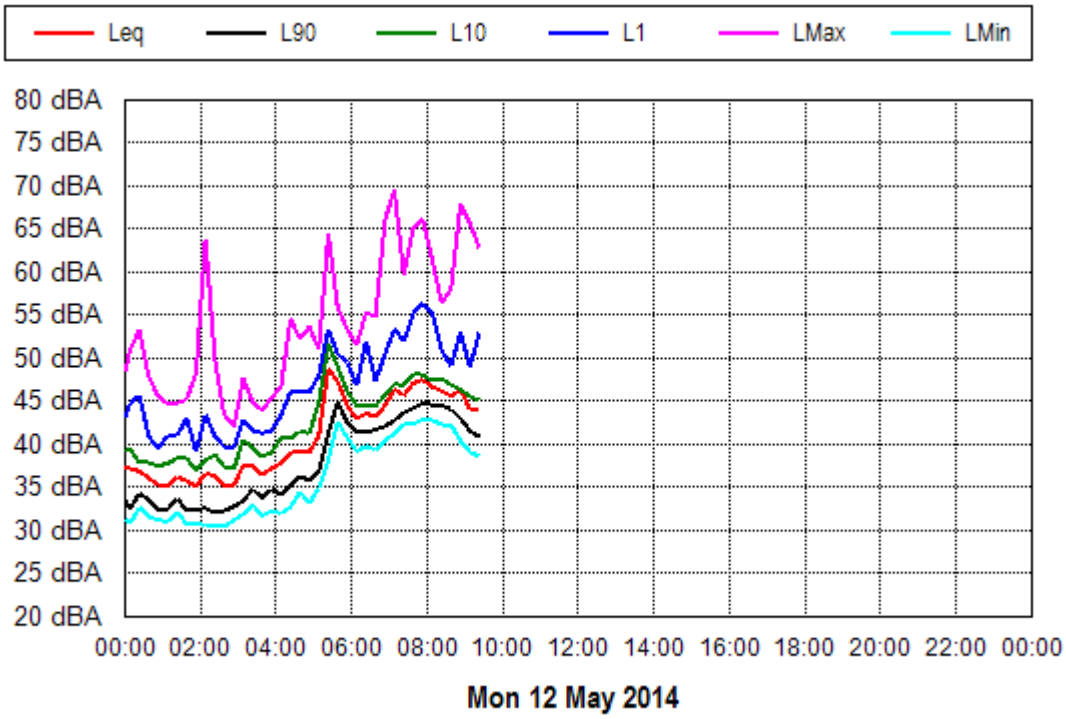


Monitoring Location 1: North-western boundary of Lot 12 DP 1158508

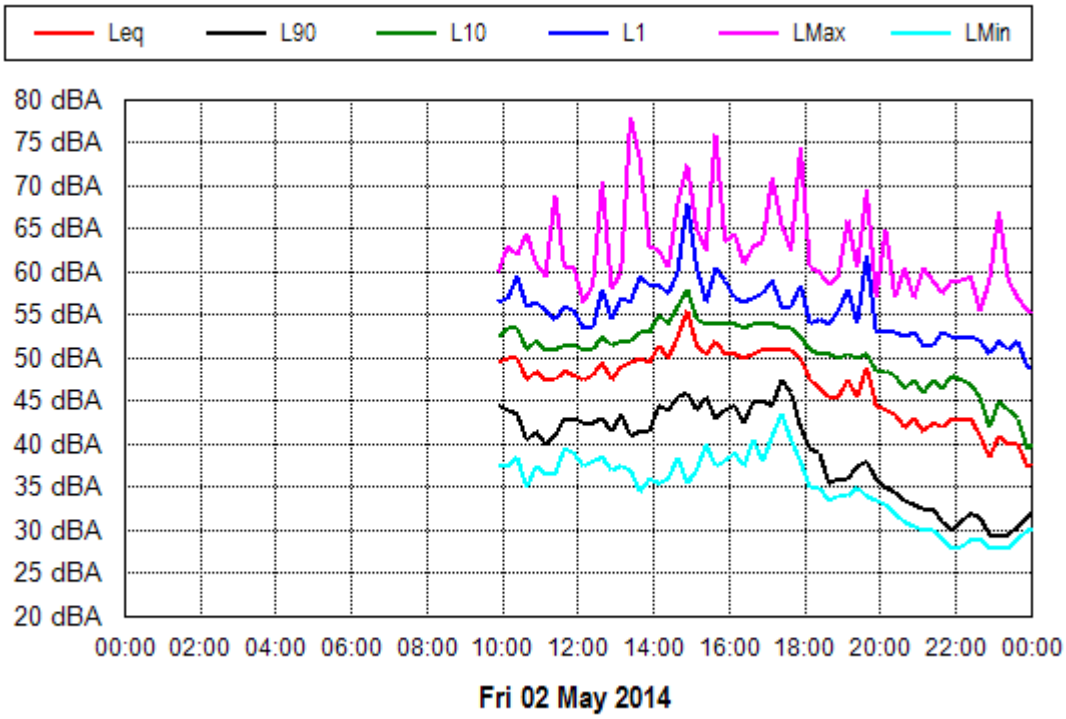


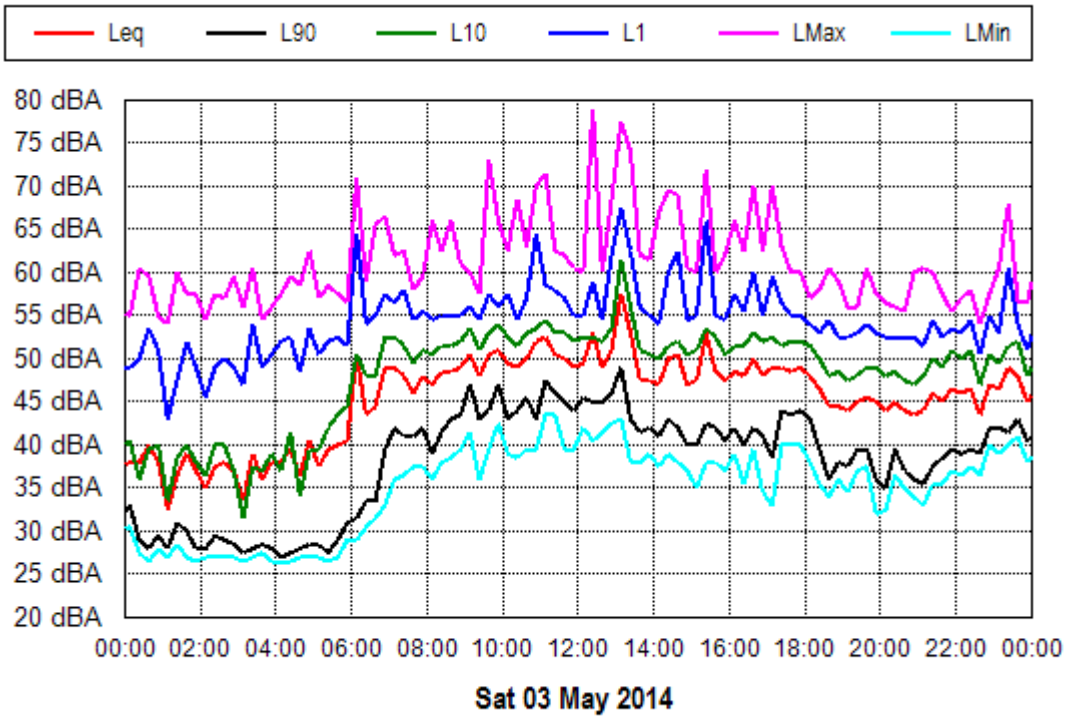


Monitoring Location 1: North-western boundary of Lot 12 DP 1158508

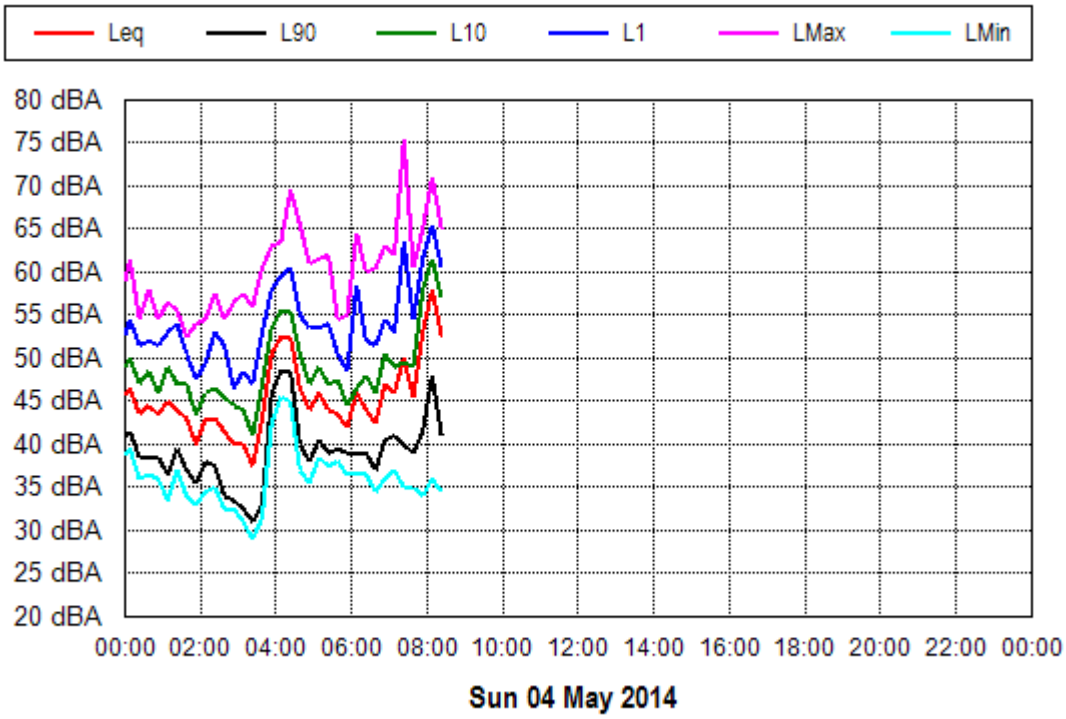


Monitoring Location 2: Back yard of 651A Freemans Drive





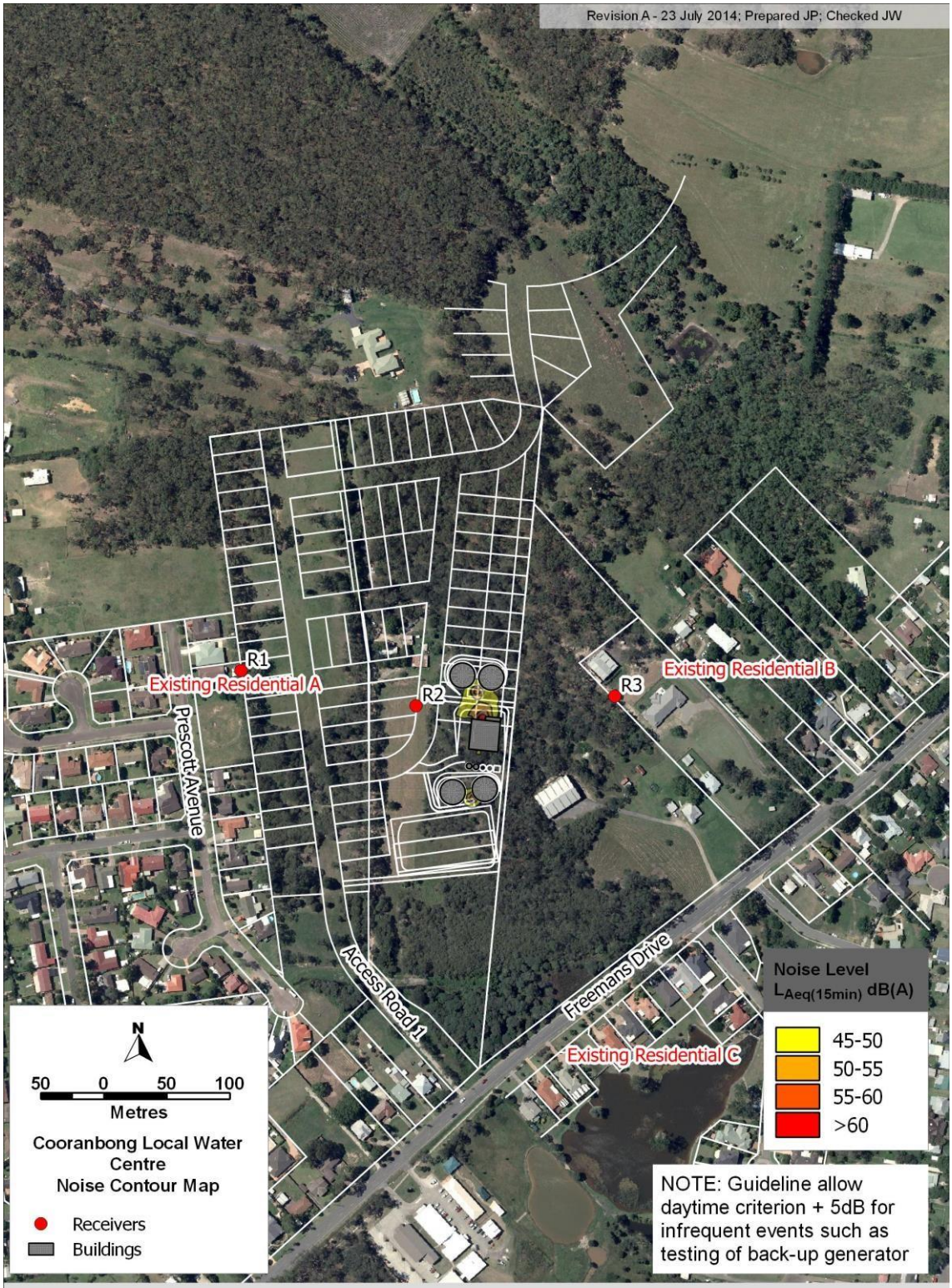
Monitoring Location 2: Back yard of 651A Freemans Drive



APPENDIX B

OPERATIONAL NOISE CONTOUR MAPS


Revision A - 23 July 2014; Prepared JP; Checked JW
R1
Existing Residential A
R2
R3
Existing Residential B
Existing Residential C
Prescott Avenue
Access Road 1
Freemans Drive
N
50 0 50 100
Metres
Cooranbong Local Water Centre
Noise Contour Map
Receivers
Buildings
Noise Level
LAeq(15min) dB(A)
35-40
40-45
45-50
50-55
55-60
>60
Normal Operation Without Back-Up Generator
With Recommended Mitigation Measures
Aerial Imagery: Google


Revision A - 23 July 2014; Prepared JP; Checked JW
R1
Existing Residential A
R2
R3
Existing Residential B
Existing Residential C
Prescott Avenue
Access Road 1
Freemans Drive
N
50 0 50 100
Metres
Cooranbong Local Water Centre
Noise Contour Map
Receivers
Buildings
Noise Level
$L_{Aeq(15min)}$ dB(A)
45-50
50-55
55-60
>60
NOTE: Guideline allow daytime criterion + 5dB for infrequent events such as testing of back-up generator
Abnormal Operation With Back-Up Generator
With Recommended Mitigation Measures
Aerial Imagery: Google

Appendix 12

Bush Fire Threat Assessment

Bushfire Threat Assessment

Cooranbong Local Water Centre Lot 12 DP 1158508 Freemans Drive, Cooranbong NSW

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Version / Date: Final / August 2014

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Document Status

Version	Purpose of Document	Orig	Review	Review Date
Draft	Draft for Internal Review	LV	SG	16th May 2014
Final	Final for Client Review	LV	RD	26th May 2014
Final	Final for Submission	RD	SG	6th Aug 2014

Approval for Issue

Name	Signature	Date
Stuart Greville		6th August 2014

BPD-PD Certification

Stuart Greville
BPD-PD-26202

Summary

RPS Australia East Pty Ltd (RPS) has been commissioned by Johnson Property Group to undertake a Bushfire Threat Assessment (BTA) for the construction of a water recycling facility, known as the Cooranbong Local Water Centre (LWC), on part of Lot 12 DP 1158508 Freemans Drive, Cooranbong. This BTA is to support the construction and operation of a water recycling facility.

Buildings within this type of development are classed as Class 5 – 8 under the National Construction Code: Building Code of Australia (BCA). It is clear from this investigation and assessment that the Study Area, in part constitutes Bushfire Prone Land. However, the specifications and requirements of Planning for Bushfire Protection (PBP 2006) do not strictly apply to these building classes. Accordingly, this BTA has considered the aims and objectives of the PBP 2006 and adopted the methodology for bushfire hazard assessment as outlined in Chapter 4.3.

This BTA found the land surrounding the Study Area to support vegetation consistent with *forest* and *forested wetland* vegetation formation as described by PBP 2006.

In summary, the following key recommendations have been generated to enable the proposed development to comply with PBP 2006:

- Bushfire buffers in the form of a Managed Fuel Zone are recommended to the north, south and west of the Study Area between the hazard/s and proposed development;
- All new buildings and structures are to be constructed in accordance with AS3959 – 2009 – Bushfire Attack Level- 29 (BAL-29);
- Internal road networks should be designed and constructed in accordance with Section 4.1.3 – Property Access of PBP 2006;
- Any proposed development is to be linked to the existing reticulated water supply and that suitable hydrants be clearly marked in accordance with AS2419.1, 2005. Alternative water supplies may be considered where the proponent accepts that an adequate supply of water for firefighting operations can be provided; and
- An Emergency Management Plan is to be prepared to identify the nearest bushfire hazards and preferred refuges and evacuation routes.

In conclusion, should the recommendations above be duly considered and incorporated, the bushfire hazard present should be reduced to a level considered necessary to provide an adequate level of protection to life and property of the Study Area; and continuing operation of the LWC, however will not prevent a bushfire from occurring offsite or radiating from the Study Area.

Finally, the implementation of the adopted measures and recommendations forwarded within this report comply with PBP (2006) and will contribute to the amelioration of the potential impact of any bushfire upon the development estate, but they do not and cannot guarantee that the area will not be affected by bushfire at some time.

Terms and Abbreviations

Abbreviation	Meaning
APZ	Asset Protection Zone
AS2419 -2005	Australian Standard – Fire Hydrant Installations
AS3959-2009	Australian Standard – Construction of Buildings in Bush Fire Prone Areas
BCA	Building Code of Australia
BPA	Bush Fire Prone Area (Also Bushfire Prone Land)
BPL	Bush Fire Prone Land
BPL Map	Bush Fire Prone Land Map
BPMs	Bush Fire Protection Measures
BTA	Bushfire Threat Assessment
EPA Act	*NSW Environmental Planning and Assessment Act 1979*
FDI	Fire Danger Index
FMP	Fuel Management Plan
ha	hectare
IPA	Inner Protection Area
LEP	Local Environment Plan
LGA	Local Government Area
LWC	Local Water Centre
OPA	Outer Protection Area
PBP	Planning for Bushfire Protection 2006
RF Act	Rural Fires Act 1997
RF Regulation	Rural Fires Regulation
RPS	RPS Australia East Pty Ltd

Contents

Tables

Figures

Appendices

1.0 Introduction

RPS Australia East Pty Ltd (RPS) has been commissioned by Johnson Property Group Pty Ltd to undertake a Bushfire Threat Assessment (BTA) for the construction of a water recycling facility, known as the Cooranbong Local Water Centre (LWC), on part of Lot 12 DP 1158508 Freemans Drive, Cooranbong, also known as 617 Freemans Drive, Cooranbong, hereafter referred to as the 'Study Area' (**Figure 1**). The Study Area has been identified as Bushfire Prone Land (BPL) by Lake Macquarie Council and has been mapped accordingly (**Figure 2**).

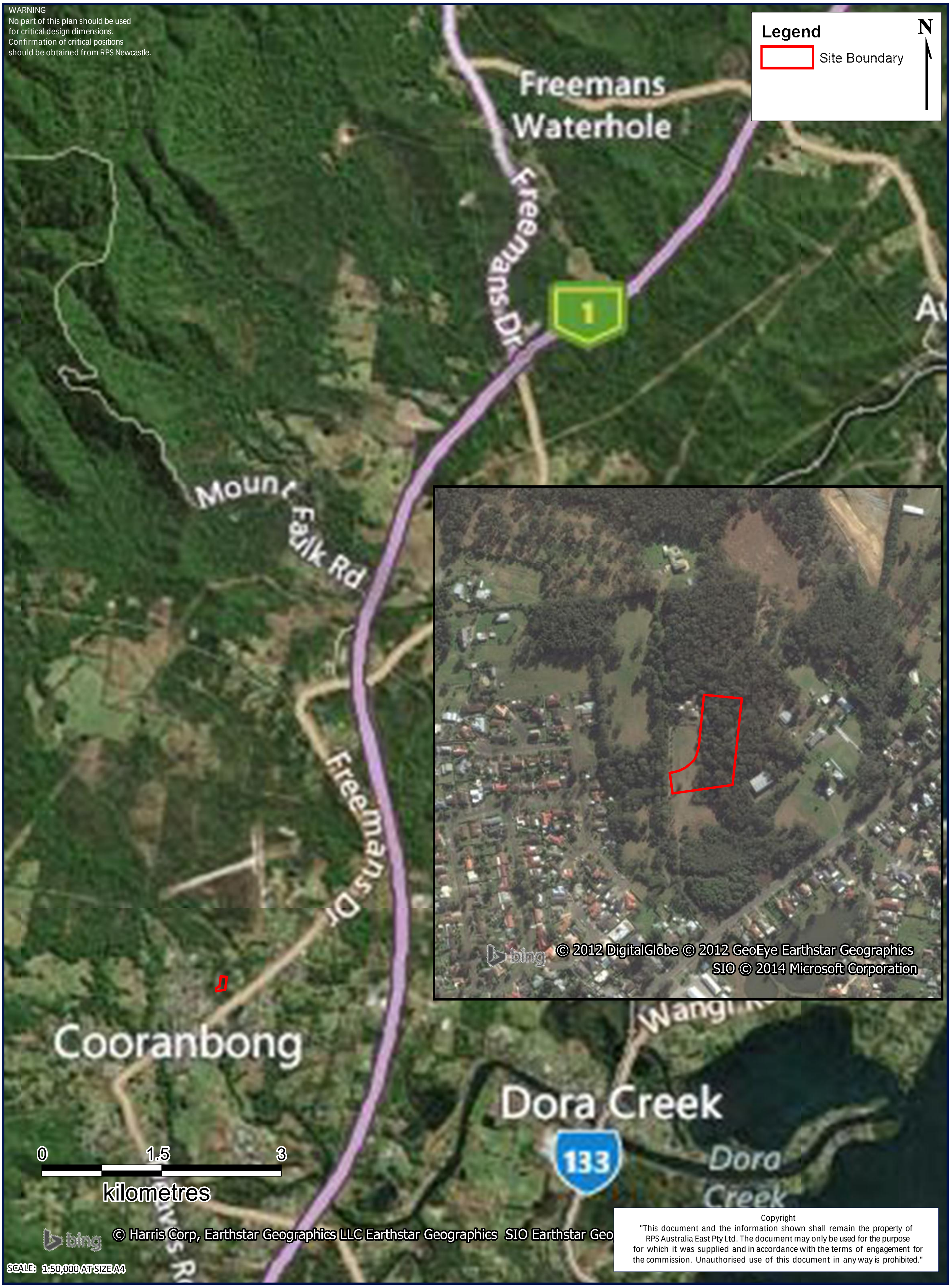
This assessment considers the bushfire hazard and associated potential threats relevant to the proposal. It also outlines the minimum mitigative measures that would be required in accordance with *Planning for Bush Fire Protection 2006 (*PBP 2006), which has been adopted by the *Environmental Planning & Assessment Amendment* (Planning for Bush Fire Protection) *Regulation 2007* & the *Rural Fires Amendment Regulation 2007.* Additionally this report addresses the requirements of Section 79BA of the *Environmental Planning & Assessment Act 1979*.

Buildings are classified within this type of development as Class 5 – 8 within the BCA. Therefore, the provisions of PBP 2006 do not strictly apply. The Study Area is however within an area that is classified as Bushfire Prone Land, and the surrounding vegetation may represent a potential threat to the proposed development. On this basis the assessment and recommendations contained within this report are based on industrial development. Accordingly the aims and objectives of PBP 2006 and the bushfire protection measures outlines in Chapter 3 have been considered as part of this BTA. Furthermore, the methodology under Chapter 4.3 to determine the level of bushfire threat for an infill development has been adopted in this instance.

1.1 Site Particulars

Locality	Part of Lot 12 DP 1158508, 617 Freemans Drive, Cooranbong, NSW.
LGA	Lake Macquarie
Area	The area to be affected by the proposal is approximately 1 ha.
Zoning	The land is currently zoned 10 Investigation pursuant to *Lake Macquarie Local Environmental Plan 2004* and application has been made for rezoning to SP2 Drainage and Sewer Infrastructure pursuant to Draft Lake Macquarie Local Environmental Plan 2014.
Boundaries	The area of the lot proposed to facilitate the Cooranbong LWC is located between two isolated portions of the site. To the east of the Study Area is a neighbouring rural residential property with remnant native vegetation.
Current Land Use	Cleared land and remnant native vegetation currently occupy the Study Area.
Topography	The Study Area slopes gently upwards from south to north, with flat areas occurring to both the east and the west.
Climate / Fire History	The Study Area lies within a geographical area with a Fire Danger Index (FDI) rating of 100. The typical climate in the Lake Macquarie BFMC area is subtropical and the bush fire season generally runs from August to March (LMBFMC 2011). Prevailing

weather conditions associated with the bush fire season are north-westerly winds accompanied by high day-time temperatures and low relative humidity.



TITLE: FIGURE 1: SITE LOCATION
LOCATION: COORANBONG
DATUM: GDA 94
PROJECTION: MGA ZONE 56
DATE: 14/05/2014
PURPOSE: BTA
LAYOUT REF:
VERSION (PLAN BY): JS (A A4)

CLIENT: JOHNSON PROPERTY GROUP
JOB REF: PR122011

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Figure 2 Bushfire Prone Land

1.2 Description of Proposal

The Cooranbong LWC will utilise sewage from the future residential area to produce high quality water. The sewage will be treated at the Study Area to provide recycled water plumbed into houses for non-potable uses such as toilet flushing, washing machines, irrigation and car washing, thus reducing potable water demand. The facility, located upon part of Lot 12 DP 1158508, is intended to operate 24 hours, 7 days per week, housed in a low-scale, single level building within an open space setting.

The intended capacity of the Cooranbong LWC is approximately 1,000kL per day, although the facility has been designed to achieve this benchmark over time in line with uptake in the residential area surrounding the development.

- The Study Area will have permanent vehicle access from a future road created through the subdivision process;
- The Study Area accommodates the main water recycling facility within an enclosed structure which also includes equipment and instrumentation for operation of the treatment process;
- The water recycling facility building occupies an area of approximately 600m^2;
- The Study Area has potential to accommodate tanks for storage of recycled water (2), drinking water (2), and for chlorine (1) and the like. These will be installed on a gradual basis as the development expands;
- Hardstand areas for vehicles are provided for delivery and maintenance purposes. A service driveway and concrete hardstand is located on the western side of the operations building that will link to the new road within the subdivision.
- External lighting will be provided to the external areas of the building which is configured with movement

sensors and light sensors to provide additional deterrent against vandalism and graffiti. CCTV monitoring of external areas will be provided for security;

- All buildings and facilities will be designed and constructed in accordance with *Building Code of Australia* (BCA) requirements; and
- Areas for soft landscaping have been provided to complement the architecture of the Cooranbong LWC and surrounding residential area.

Although the facility will operate 24 hours a day, 7 days a week, no full time employees are required to maintain operation. Therefore, the protection of human life in the event of a bushfire is enhanced as the facility will primarily be void of people.

A site plan for development of the proposal is contained in **Appendix 1**.

1.3 Objectives of Assessment

This assessment has been undertaken to address the following in relation to Industrial developments:

- Consider the risk of bushfire attack to the Study Area and potential threat to life and property;
- Afford occupants of any building and customers present on the Study Area adequate protection from exposure to a bush fire;
- Provide for an appropriate defendable space around buildings;
- Provide appropriate separation between a hazard and buildings which, in combination with other measures, reduces the potential for direct flame contact and material ignition;
- Ensure that safe operational access and egress for emergency service personnel is available;
- Provide for ongoing management and maintenance of bush fire protection measures, including fuel loads in the Asset Protection Zone (APZ); and
- Ensure that utility services are adequate to meet the needs of fire-fighters (and others assisting in bush fire fighting)

1.4 Acceptable Solutions for Infill Developments

Industrial buildings are classified within this type of development as Class 5 – 8 within the BCA. Therefore, the specifications and requirements of PBP 2006 do not strictly apply to these building classes.

Nevertheless, Section 4.3.6 of the PBP 2006 must be considered. Accordingly, acceptable solutions for infill development can be used for industrial developments such as this. These include:

- APZs to be determined in accordance with Appendix 2 of PBP 2006;
- Buildings are designed and sited in accordance with the siting and design principles in section 4.3 of PBP 2006;
- Construction determined in accordance with Appendix 3 of PBP 2006 and the Requirements for attached garages and other structures in this section;
- Compliance with Section 4.1.3 of PBP 2006 for property access roads;
- Compliance with Section 4.2.7 of PBP 2006 for access standards for internal roads;
- Compliance with Section 4.1.3 of PBP 2006 for services – water, electricity and gas; and
- Compliance with Appendix 5 in PBP 2006 relating to the continued maintenance of landscaped areas.

2.0 Bushfire Hazard Assessment

2.1 Vegetation Assessment

2.1.1 Methodology

Vegetation classification over the Study Area has been carried out as follows:

- Aerial Photograph Interpretation to map the vegetation classification and extent; and
- Reference to regional vegetation community mapping.

In accordance with PBP 2006, an assessment of the vegetation over a distance of 140m in all directions from the Study Area was undertaken. Vegetation that may be considered a bushfire hazard was identified in all directions from the Study Area. **Table 1** outlines the hazard types on site.

2.1.2 Predominant Vegetation Formation

Table 1 Vegetation Classification

Direction	Vegetation Community	Classification of Vegetation Formations
North	Coastal Plains Scribbly Gum Woodland	Forest (Hazard)
East	Coastal Plains Scribbly Gum Woodland	Forest (Hazard)
South	Red Mahogany Apple Paperbark Forest	Forested Wetland (Hazard)
West	Coastal Plains Scribbly Gum Woodland	Forest (Hazard)

In accordance with Table A2.1 (PBP 2006), the Coastal Plains Scribbly Gum Woodland vegetation community constitutes “Forest”. Additionally the Red Mahogany Apple Paperbark Forest constitutes Forested Wetlands as this vegetation is periodically inundated and contains swamp vegetation (**Figure 2**).

2.2 Effective Slope Assessment

2.2.1 Methodology

Slope assessment has been undertaken as follows:

- Aerial Photograph Interpretation in conjunction with analysis of electronic contour maps with a contour interval of 2m.

In accordance with PBP 2006, an assessment of the slope affecting the bushfire behaviour was undertaken for a distance of 100m from the edge of the Study Area boundary in the direction of the bushfire hazard.

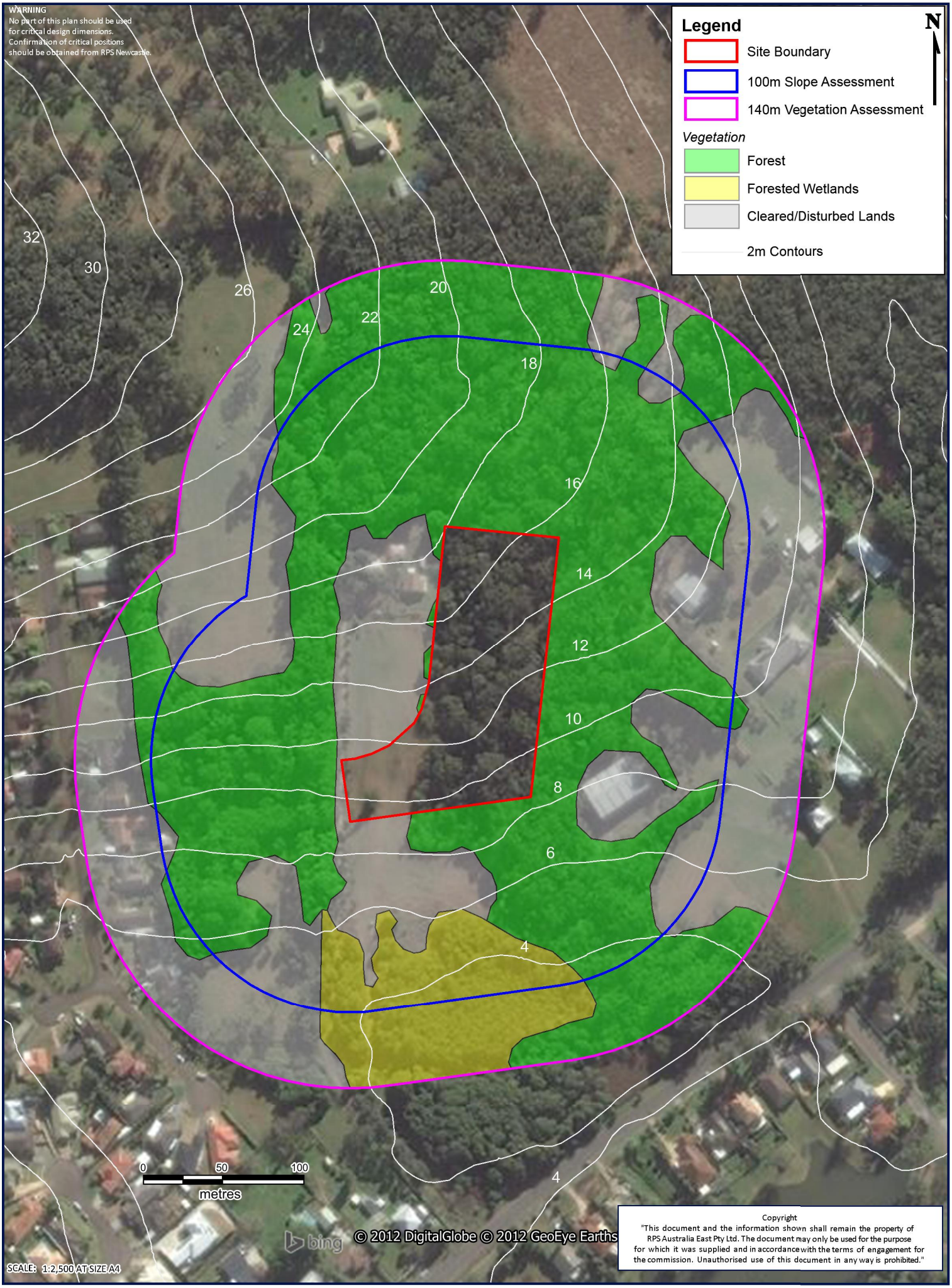
The slopes leading away from the Study Area in the direction of the identified bushfire threat have been evaluated to identify both the average slope and by identifying the maximum slope present. These values help determine the level of gradient which will most significantly influence the fire behaviour of the Study Area.

2.2.2 Effective Slope

The slope of the bushfire hazard is documented in **Table 2** below.

Table 2 Slope Assessment

Direction of Vegetation	Vegetation Type	Slope Classes
North	Forest	Upslope
East	Forest	Cross slope
South	Forested Wetland	0-<5° Downslope
West	Forest	Cross slope



TITLE: FIGURE 3: SLOPE/ VEGETATION ASSESSMENT

LOCATION: COORANBONG

DATUM: GDA 94
PROJECTION: MGA ZONE 56

DATE: 14/05/2014
PURPOSE: REPORT

LAYOUT REF:
VERSION (PLAN BY): JS (A A4)

CLIENT: JOHNSON PROPERTY GROUP
JOB REF: PR122011

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3.0 Bushfire Protection Measures

The proposed development is classified as Industrial development. Buildings are classified within this type of development as Class 5 - 8 within the BCA. Therefore, the provisions of PBP 2006 do not strictly apply. The Study Area is however within an area that is classified as Bushfire Prone, and the surrounding vegetation presents a potential threat to future development.

An assessment of the existing vegetation surrounding the Study Area and the likely future use of the land has been undertaken.

3.1 Managed Fuel Zones

Setbacks are typically provided by Asset Protection Zones APZs to separate a habitable dwelling from a bushfire threat. Non-habitable dwellings may be located within an APZ, however it is generally recommended that where possible, all economic assets are provided with some form of separation that can be used as defendable space and for evacuation routes. For the sake of this assessment, the implementation of Managed Fuel Zones (MFZ) will provide for a suitable defendable space in the event of a bushfire.

3.1.1 Determining the Appropriate Setbacks

Setbacks for the proposed development have been calculated in accordance with PBP 2006 with regard to infill development. Although the development is industrial, ideally MFZs should be provided in accordance with the acceptable solutions applied to residential subdivision. As such, the appropriate width setbacks have been calculated based on the topography and the vegetation on and around the Study Area. The Study Area lies within the Lake Macquarie LGA and therefore is assessed under an FDI rating of 100.

Table 3 and **Figure 3** outline the MFZ components for the Study Area.

Table 3 MFZ Components

Direction of Hazard	Hazard	Slope Classification	MFZ
North	Forest	Upslope	20m
East	Forest	Cross slope	20m
South	Forested Wetland	0-<5° Downslope	20m
West	Forest	Cross slope	20m

Vegetation to the north and west of the Study Area is proposed to be cleared for residential development and subsequently developed. Additionally, a 6m road will abut the western boundary between the dwellings and the facility. A managed landscape buffer will be situated between the residential lots to the north and the facility. A stormwater detention basin with an area of 3600m^2 abuts the southern boundary, separating the facility with the E2 Conservation area and hazard. A 4m fire trail will be situated between the eastern boundary of the facility and the vegetation to the east and the buildings will be situated 10m from the boundary. This 10m division does not adequately provide a 20m MFZ as recommended. As such, the buildings in this location will be subject to stricter construction standards as outlined in the AS3959 – 2009.

3.2 Design and Construction

The BCA does not provide for any bush fire specific performance requirements for non-habitable buildings and as such AS 3959-2009 does not apply as a set of 'deemed to satisfy' provisions. The general fire safety construction provisions are taken as acceptable solutions, but the aim and objectives of PBP 2006 apply in relation to other matters such as access, water and services, emergency planning and landscaping/ fuel management. These matters have been addressed later in this assessment.

Although they are not 'deemed to satisfy' conditions, it is recommended that the proposed fully enclosed buildings that will be occupied by employees be designed in accordance with AS3959-2009 – Construction of buildings in bushfire prone areas to a BAL-29 level of construction.

The determinations of the appropriate BAL are based upon parameters such as weather modelling, fire-line intensity, flame length calculations, as well as vegetation and fuel load analysis. The determination of the construction level is derived by assessing the:

- Relevant FDI = 100
- Flame temperature
- Slope
- Vegetation classification; and
- Building location.

In addition to these standards, gutter guards may be installed to prevent fuel accumulation of debris and leaf litter and should include the following specifications:

- Installed with gutter guarding having flammability index of not more than 5, when tested to AS 1530.2;
- Limited to the lowest possible levels (bottom fascia) to improve access and maintenance; and
- Covered with a mesh of aluminium bronze or stainless steel with a maximum aperture of 5 mm fixed to the outer edge of the gutter and be located beneath the second (or higher) row of tiles or roof sheeting of 250 mm;

Box gutters should be avoided.

3.2.1 Bushfire Attack Level for the Proposed Development

Using the Addendum: Appendix 3 (NSW Rural Fire Service, 2010), the information relating to vegetation and slope as presented within this report and according to Table 2.4.2 of AS3959-2009 the BAL for the Study Area was calculated.

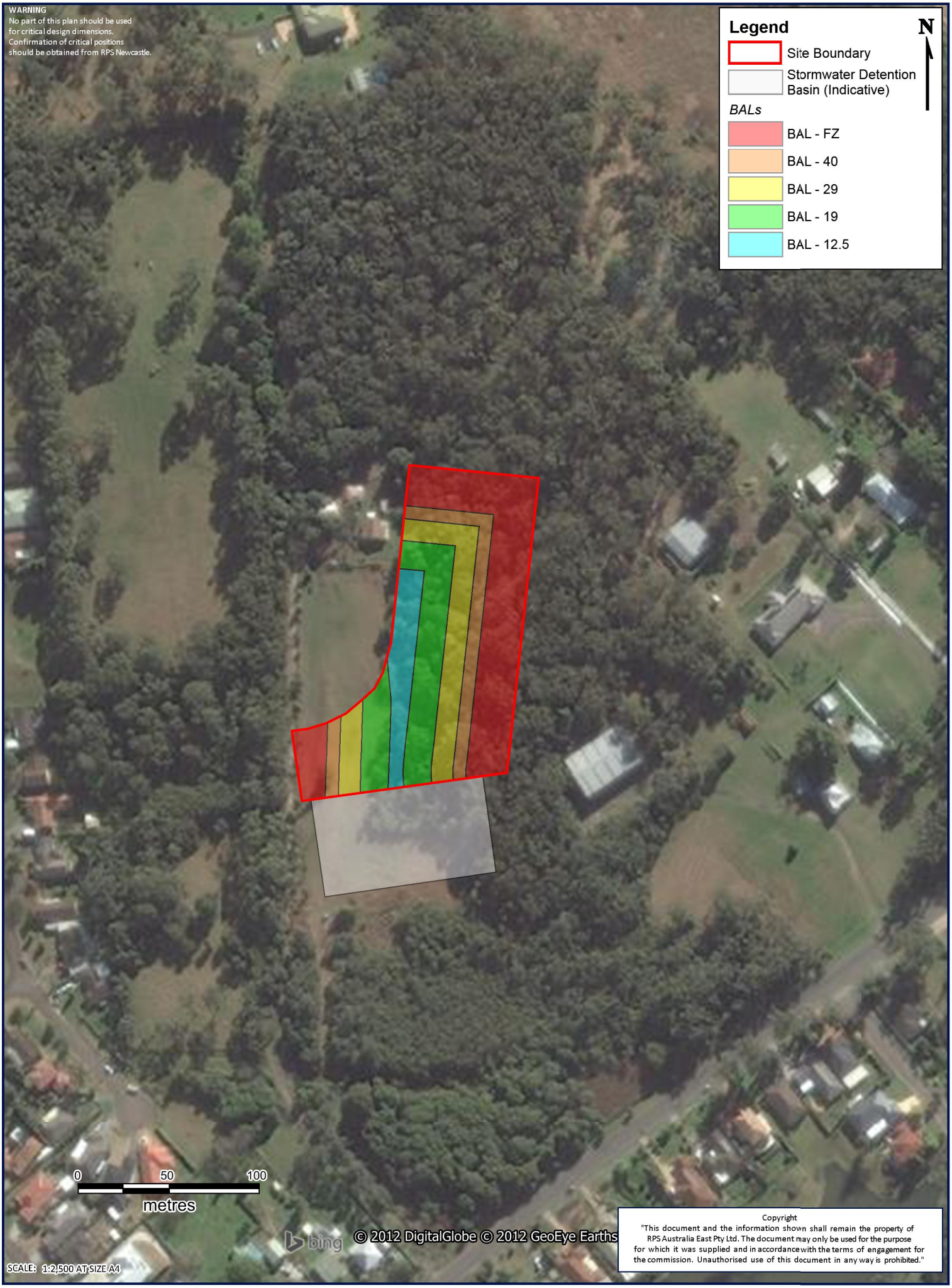
The current site plan situates some of the proposed buildings within the BAL-FZ. This is a risk towards assets only, not human life as no full time employees are required on site to operate the facility.

Refer to **Table 4** and **Figure 4** for the BALs calculated for the Study Area.

Table 4 Required BAL (AS 3959-2009)

Direction of Hazard	Vegetation Classification (PBP 2006)	Slope Class	Separation Distance	BAL	Construction Section (AS3959-2009)

Direction of Hazard	Vegetation Classification (PBP 2006)	Slope Class	Separation Distance	BAL	Construction Section (AS3959-2009)
North	Forest	Cross slope	<19m	BAL – FZ	Sect 4, 5, 6, 7, 8 and 9 of AS3959-2009 and Sect A3.7 of PBP Addendum Appendix 3.
			19-<25m	BAL – 40	
			25-<35m	BAL – 29	
			35-<48m	BAL – 19	
			48-<100	BAL – 12.5	
East	Forest	Cross slope	<19m	BAL – FZ	
			19-<25m	BAL – 40	
			25-<35m	BAL – 29	
			35-<48m	BAL – 19	
			48-<100	BAL – 12.5	
South	Rainforest	0-<5° Downslope	<10m	BAL – FZ	
			10-<14m	BAL – 40	
			14-<20m	BAL – 29	
			20-<29m	BAL – 19	
			29-<100m	BAL – 12.5	
West	Forest	Cross slope	<19m	BAL – FZ	
			20-<25m	BAL – 40	
			25-<35m	BAL – 29	
			35-<48m	BAL – 19	
			48-<100	BAL – 12.5	
			20-<25m	BAL – 40	



TITLE: FIGURE 4: BUSHFIRE ASSESSMENT LEVELS	LOCATION: COORANBONG	DATUM: GDA 94 PROJECTION: MGA ZONE 56	DATE: 14/05/2014 PURPOSE: BTA	LAYOUT REF: VERSION (PLAN BY): JS (A A4)

CLIENT: JOHNSON PROPERTY GROUP
JOB REF: PR122011

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3.3 Access

The following road specifications are considered as acceptable solutions as detailed within Section 4.1.3 of PBP 2006. Deviations from these solutions for access may be considered (depending on the situation) through a performance-based assessment.

In the event of a serious bushfire threat to the proposed development, it will be essential to ensure that adequate evacuation routes are provided and access to all areas of retained adjacent vegetation (both on-site and adjacent) is feasible. It is recommended that all internal roads be designed to the specifications outlined below during the subsequent design stages.

The main access and proposed internal roads are described below:

- The Study Area will have permanent vehicle access from a future road created through the subdivision process of the overall site;
- The proposed driveway to the main entry point of the facility will be two-wheel drive all weather road;
- 4m Fire trails will exist to the south, east and north of the Study Area, providing two entry/egress routes that are connected to the proposed road in the subdivision;
- There is a minimum vertical clearance to a height of four metres above the road at all times; and
- Traffic management devices (if needed) are constructed to facilitate access by emergency service vehicles.

Access to the Study Area is displayed in **Figure 5**.

3.4 Water

Following any kind of additional development upon the Study Area, it is preferred that water mains will be extended into the development from the existing infrastructure. Provision of access to this supply should be provided in accordance with AS 2419.1 – 2005.

Where the provision of water is required, it is recommended that a reticulated system is installed in accordance with the Australian Standard. Alternatively, a static water supply located in close proximity to the asset/s may be considered acceptable where it can be guaranteed that it is dedicated for fire fighting purposes (existing dam to the north of the proposed development). Given that the proposal includes four stored water tanks equalling approximately 4,800 kL of water, this would suffice as a static water supply to be used in the event of an emergency.

Any non-reticulated water supplies dedicated for firefighting purposes should comply with Section 4.1.3 of the PBP 2006.

3.5 Gas

Any reticulated or bottled gas should be installed and maintained according to the requirements of the relevant authorities and AS 1596 – 2002. It is expected that the location of gas services will not lead to ignition of surrounding bushland or the fabric of buildings.

Additionally any flammable or hazardous materials are to be stored separately in a suitably bunded area no less than 100m from the nearest identified bushfire threat.

TITLE: FIGURE 5: BUSHFIRE PROTECTION MEASURES	LOCATION: COORANBONG	DATUM: GDA 94 PROJECTION: MGA ZONE 56	DATE: 14/05/2014 PURPOSE: BTA	LAYOUT REF: [illegible] VERSION (PLAN BY): JS (A A4)

CLIENT: JOHNSON PROPERTY GROUP
JOB REF: PR122011

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3.6 Fire Fighting Capability

To facilitate quick and efficient action by the Fire Brigade / Rural Fire Service upon arrival, it is recommended that all necessary connections / pumps etc on the property be clearly marked and visible, and in good working order. Stored water tanks will exist on site in which fire fighters can utilise in the event of an emergency. In this regard all stored water tanks should be fitted with a suitable connection – 65mm Storz outlet with a Gate or Ball valve.

3.7 Landscaping

Landscaping should be designed and managed to minimise flame contact and radiant heat to buildings and the potential for wind driven embers to cause ignitions.

In choosing plants for landscaping consideration should be given to plants that possess properties, which help to protect buildings. If the plants themselves can be prevented from ignition, they can improve the defence of buildings by:

- filtering out wind-driven burning debris and embers;
- acting as a barrier against radiation and flame; and
- reducing wind forces.

Consequently landscaping of the Study Area should consider the following:

- meet the specifications of an Inner Protection Area (IPA) detailed in PBP 2006;
- priority given to retaining or planting species which have a low flammability and high moisture content;
- priority given to retaining or planting species which do not drop much litter in the bushfire season and which do not drop litter that persists as ground fuel in the bush fire season; and
- create discontinuous or gaps in the vegetation to slow down or break the progress of fire towards the dwellings.

Consideration should also be given to species planted to the south of the Study Area as the neighbouring vegetation is proposed to be zoned as E2 Environment Conservation. Species that are non native and quick to regenerate should not be planted near the conservation lands to help prevent the spread of exotics and to maintain its ecological integrity.

3.8 Vegetation Fuel Management

Consideration should be given to vegetation fuel loads present on site with particular attention to MFZs.

Careful thought must be given to the type and physical location of any proposed site landscaping. Inappropriately selected and positioned vegetation has the potential to ‘replace’ any previously removed fuel load.

Bearing in mind the desired aesthetic and environment sought by site landscaping, some basic principles have been recommended to help minimise the chance of such works contributing to the potential hazard on site.

Whilst it is recognised that fire-retardant plant species are not always the most aesthetically pleasing choice for site landscaping, the need for adequate protection of life and property requires that a suitable balance between visual and safety concerns be considered.

It is reiterated again that it is essential that any landscaped areas and surrounds are subject to ongoing fuel management and reduction to ensure that fine fuels do not build up.

The primary objective of an integrated system of bushfire protection measures is to maintain the safety of all those persons on site, however given that no full time employees are required to operate this facility, the focus is primarily on the assets. Economic assets and infrastructure that is not critical to the ongoing operation can be assessed for its capability of withstanding bushfire attack. Furthermore, the consequences of those assets failing and subsequent recovery time and cost should be acknowledged prior to reducing the desired bushfire protection measures.

4.0 Conclusion and Recommendations

It is clear from this investigation and assessment that the Study Area constitutes Bushfire Prone Land. In accordance with the provisions of PBP 2006, the recommendations outlined within this assessment will substitute as appropriate actions to reduce the risk of damage and/or harm in the event of a bushfire event.

This BTA found the land surrounding the Study Area to support vegetation consistent with Forest and Forested Wetland as described by PBP 2006.

In summary, the following key recommendations have been generated to enable the proposed development to comply with PBP 2006:

- Bushfire buffers in the form of a Managed Fuel Zone are recommended to the north, south and west of the Study Area between the hazard/s and proposed development;
- All new buildings and structures are to be constructed in accordance with AS3959 – 2009 – Bushfire Attack Level- 29 (BAL-29);
- Internal road networks should be designed and constructed in accordance with Section 4.1.3 – Property Access of PBP 2006;
- Any proposed development is to be linked to the existing reticulated water supply and that suitable hydrants be clearly marked in accordance with AS2419.1, 2005. Alternative water supplies may be considered where the proponent accepts that an adequate supply of water for firefighting operations can be provided; and
- An Emergency Management Plan is to be prepared to identify the nearest bushfire hazards and preferred refuges and evacuation routes.

A review of the Study Area and proposed development layout indicates that compliance with the above recommendations can be achieved or practically implemented without substantial change to the proposed layout or construction methodology.

Finally, the implementation of the adopted measures and recommendations forwarded within this report comply with PBP 2006 and will contribute to the amelioration of the potential impact of any bushfire upon the development, but they do not and cannot guarantee that the area will not be affected by bushfire at some time.

5.0 Bibliography

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Appendix 1

Development Plan

PERMEATE PARTNERS

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N

1:1 SHEET PRINT SCALE
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NO.	DATE	DRAFTER	DESIGN	MGMT	DESCRIPTION
5	14.05.15	GO	AC	K.D.	PRELIMINARY ISSUE FOR FOR DISCUSSION
4	14.05.13	GO	AC	K.D.	PRELIMINARY ISSUE FOR FOR DISCUSSION
3	14.05.13	GO	AC	K.D.	PRELIMINARY ISSUE FOR FOR DISCUSSION
2	14.05.12	GO	AC	K.D.	PRELIMINARY ISSUE FOR FOR DISCUSSION
1	14.04.17	GO	AC	**	PRELIMINARY ISSUE FOR REVIEW

CLIENT
flow systems

NAME: Cooranbong Water
PROJECT: Cooranbong Local Water Centre

Design	Date	Drafting	Date
KRD	15-May-14	MDP	15-May-14

TITLE: SITE PLAN LOCATION PLAN

SCALE 1:1000	PERMEATE PROJECT # C14107	PERMEATE DRAWING # C14107 - P010
SHEET A3	CLIENT PROJECT # TBA	CLIENT DRAWING # TBA

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PUBLIC APPLICATION

Cooranbong Water

Appendix 3.5.1(f) Flow Systems Response to DA Submissions

flow systems

Cooranbong Community FAQ

October 2014

ENQUIRIES
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enquiry@flowsystems.com.au

VISIT
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www.flowsystems.com.au

Introduction

The purpose of this document is to provide information in response to commonly asked questions about the sustainable water network being proposed at the new development called Watagan Park in the community of Cooranbong. It has been prepared by Flow Systems, the independent water utility that would own and operate the local utility, Cooranbong Water, if planning approval is provided.

What is being proposed?

The developer of Watagan Park, has selected an independent water utility to provide water services in the new sub-division called Watagan Park in Cooranbong. This water utility is called Cooranbong Water, a wholly owned subsidary of an Australian company called Flow Systems.

Sustainable management of water resources is at the heart of what is being proposed. Residents in the new neighbourhood will have a dual water supply – drinking water, sourced from a bulk water supply agreement with Hunter Water, and a recycled water supply, called refined water, for flushing toilets, irrigation and to use in washing machines. In addition to its environmental benefits, the dual water supply will make the community highly water efficient, creating a more secure water supply, extending the life of water infrastructure to the existing community and reducing the increase in demand for potable water supplies.

How is this different to Hunter Water?

Cooranbong Water will use a pressure sewer network, supply two qualities of water to people's homes through separate pipes and includes a Local Water Centre, which will process wastewater and generate refined water in the community. A feature of this solution is that there is no discharge from the Local Water Centre or the sewer network into the local environment or its waterways.

Do you propose to harvest stormwater?

In Cooranbong our focus is to supply drinking water via a bulk water agreement with Hunter Water, collect wastewater and produce and supply refined water. We are investigating the feasibility of harvesting stormwater during times of peak demand for refined water to supplement our primary water source but this would only be limited volumes at certain times of the year.

Lake Macquarie City Council will be responsible for managing stormwater throughout the development.

Are you planning to intercept the current sewerage system?

No. We do not plan to sewer mine.

Why has the developer been able to choose its water utility?

In NSW, the Water Industry Competition Act (2006) allows private water utilities to provide services under licence from the government. These utilities are regulated by the Independent Pricing and Regulatory Tribunal (IPART), much like Hunter Water and Sydney Water.

How will you work with Hunter Water?

We are working closely with Hunter Water on this project and a number of similar projects in the region.

In the case of Cooranbong, this will include a negotiated agreement with Hunter Water to source drinking water, which may include a backup agreement to dispose of surplus wastewater for short periods if we need to.

Our relationship with Hunter Water is ongoing and does not just relate to Cooranbong. If it is approved, we would continue to work with Hunter Water once the local water network is operational to support each other's services.

Technical

What is a pressure sewer system?

Pressure sewer is a method of collecting wastewater from homes to send it for treatment. Pressure sewer is a well-established alternative to gravity sewer. One of its benefits is that rainwater and stormwater can't flow into the network and there are no wet weather overflows to the environment. This results in sewage networks, pumping stations, storage and treatment facilities that are six to eight times smaller than a traditional centralised gravity fed network.

Pressure sewer is suited to difficult ground conditions, such as rock and high water tables.

There are more than 50,000 properties currently being serviced using pressure sewer in Australia and many more under construction.

Given that the piping systems are under pressure, does that mean that they can leak wastewater or water into the soil?

It is universal industry practice to use pressure pipes to supply water. We will meet industry standards in their design and installation to prevent leaking. For pressure sewer we use industry standard thick-walled high density polyethylene (HDPE) pipes and fusion welded joints. This method means leaks are less likely than in traditional gravity sewer systems. The pipes are designed to have the same life expectancy as a typical domestic building, which is 50 years.

How long does your piping last?

Our water and wastewater networks, including the pipes, are designed and constructed to Australian Standards and design guidelines published by the Water Services Association of Australia (WSAA), the peak industry body for the Australian urban water sector.

The pipes we use are made from HDPE and polyvinylchloride (PVC) pressure pipe as specified by WSAA. These materials are widely used throughout Australia and by public water authorities.

These pipes are designed to have the same life expectancy as a typical domestic building, which is 50 years. Experience in Europe has shown that buried PVC pressure pipes dug up after 60 years of active use were proven to be fit for purpose when analysed and likely to have a further life expectancy of 50 years.

What is the contingency allowance on your equipment?

We have 100 percent contingency and redundancy allowances on all critical equipment such as pumps, inlet screens and disinfection equipment.

What happens with viruses and bacteria in the water?

Cooranbong Water's refined water will remove bacteria, protozoa and viruses in accordance with the Australian Guidelines for Water Recycling. Removing these is part of the purification process and is a condition of our operating licence. Our water quality is closely monitored by us and government.

Environment

How does your local water network manage flooding? What contingency planning do you have in the event of flooding?

Flow's water network, including its wastewater collection, is a closed system and can continue to operate under minor flood conditions. We use pressure sewer, which means stormwater does not flow into our pipes, as it can do when a flood-prone area is serviced by a traditional gravity sewer. Also, pressure sewer pipes are not affected by groundwater infiltration, which is the primary reason that traditional sewer networks have problems with overflows that pollute the environment.

In terms of the Local Water Centre itself, we will meet all the regular construction and planning requirements to manage flooding appropriately.

Hunter Water's trunk infrastructure will be part of our contingency arrangements and we will have a protocol for notifying them if we need to use this contingency.

Will there be discharge into the local environment from the Local Water Centre?

No. One of the strongest environmental features of the Local Water Centre is that it is a closed system, and unlike a gravity sewer system, does not discharge waste into the local environment. In the case of traditional gravity sewer systems, utilities need to apply for a discharge licence to manage overflow events. We do not need such a licence as the technology and engineering means there will be no overflows, including to Avondale Springs.

Has the release of phosphates and nitrogen into the natural environment been considered?

Unlike traditional sewerage services, there is no discharge into local watercourses from our Local Water Centres. The way that water reaches the natural environment from our water network is through runoff from watering gardens and water used outdoors. We have completed a land capability assessment as part of our network operator's licence application that considers the effect of any trace elements in our refined water. Most of the outdoor water use in the community will be to establish new gardens and for irrigating public spaces, such as sporting fields and parks. This will contribute to the maintenance and upkeep of these public facilities. Our intention will be to irrigate with no negative environmental impact, including Avondale Springs and other surrounding waterways. Our irrigation will be guided by our conditions of approval and national and state guidelines for water recycling.

Local Water Centre

What will the Local Water Centre do?

Wastewater will be collected from homes, including kitchens, bathrooms and laundries, and sent to the Local Water Centre where it will be processed and the resulting water purified to the highest Australian standards, undergoing seven extensive filtration and purification processes including a membrane bioreactor (MBR), ultraviolet (UV) and chlorine disinfection. The process meets strict Australian Guidelines for Water Recycling set out by Federal and State Governments.

Refined water, Cooranbong Water's product name for recycled water, is the main product from the Local Water Centre, which will be sent back to homes and other end-users to flush toilets, for irrigation and to use in washing machines. By producing refined water, the community connected to Cooranbong Water will be highly water efficient. Its refined water supply will not be subject to water restrictions during periods of drought, which means a secure water supply to water your garden and other outdoor uses such as washing your car.

Where will the Local Water Centre be located?

The proposal is to build the Local Water Centre at 617 Freemans Drive, Cooranbong.

Is the land required for the Local Water Centre appropriately zoned?

Yes. The development application is governed by the 2004 LEP, which is the enforceable instrument for this application. Utility installation is a permissable use with Council's consent, under this LEP.

Will the sewer pumping station originally proposed for 60 Avondale Road be going ahead?

No. It is not needed.

Why isn't the Local Water Centre in the centre of the estate?

Hunter Water Corporation has mandated where the connection points are to their infrastructure. This has been a major factor in the location of the proposed Local Water Centre. Based on Hunter Water's Servicing Strategy, regardless of the utility, the water facilities would have been outside the Watagan Park release area.

What is the proposed capacity of the Local Water Centre?

The Local Water Centre will have the capacity to service 2,400 homes or the equivalent to include the new shopping area.

The daily throughput will change as the new community is built and homes connect. According to industry standards, new houses, such as that at Cooranbong, will typically generate about 420 litres of wastewater per day.

If supplemented by stormwater, the Centre will have the capacity to produce up to 1,425 kilolitres of refined water per day when the new community is complete and all homes connected. This is almost enough water to fill one Olympic swimming pool a day, which represents the amount of drinking water that could be saved. Every drop of drinking water saved is water that can be used elsewhere.

Why isn't the Local Water Centre planned with a 400 metre buffer zone to residential housing?

Using a buffer zone is a past practice to manage the impacts of odour. The current NSW guidelines, issued in 2010, (NSW Best Practice Odour Guidelines) take the approach that it is the outcome that is important, not an arbitrary buffer zone. As a result, the guidelines do not have minimum distance requirements. Instead we are required to make sure that neighbours are not affected by odour from our Centre. In technical terms this means that our Local Water Centre cannot generate odours that exceed 2 odour units where there are residential homes. Modelling of our proposed design falls well within this limit. Unlike traditional treatment plants such as the one at Marconi Road, Dora Creek, the proposed Local Water Centre does not emit high levels of odorous gases.

Will there be odours emitted from the site?

The closest existing home is 110 metres from the proposed Local Water Centre. We do not expect that neighbours or anyone passing by will be able to smell any odours from the Centre.

Odour modelling, completed as part of the environmental impact assessment for the Cooranbong Local Water Centre, demonstrates that no odours in excess of 2 odour units will occur beyond the property boundary of 617 Freemans Drive, Cooranbong. This report is available as an appendix to the EIS.

Our experience at other sites has been that there is no odour from our Local Water Centres because of the type of technology we use. Our system contains and filters odours.

Odour modelling is a complex science and Flow abides by the EPA guidelines in the design of its Local Water Centres. If people can smell it when it is in operation, we will work with the community to ensure that appropriate mitigation actions are taken promptly. If the community isn't satisfied with our response, they also have recourse to the consent authority, which in this case is Lake Macquarie City Council.

Will there be methane gas or other substances produced?

Our system uses a membrane bioreactor, not a digester system, which does not produce methane gas or other similar substances.

Will there be noise emitted from the site?

In similar systems in operation, at the boundary of the Local Water Centre property, the noise is no louder than that of suburban background noise. These levels will be verified in the detailed design of the Centre. The EIS considers noise.

Is there any waste produced at your Local Water Centre? How much and where does it go?

We are proposing a process that includes a membrane bioreactor (MBR). Most of the solids found in sewage are consumed by microbes in the MBR. As a general rule, no more than five percent of the volume of wastewater passing through the Local Water Centre is removed in either a solid or liquid waste form. If in a liquid form, it may be removed by discharge into Hunter Water's centralised sewer system. Otherwise, it will be dewatered and removed by a waste collection contractor. It is non-toxic and, when spadeable, can be used as a soil conditioner.

There is an even smaller amount of household rubbish that is separated in the process. This waste, usually plastics or fibre, has been macerated when passing through grinder pumps and is screened out as part of the purification process. This waste is removed in the regular council rubbish collection.

In the case of Cooranbong, as the environmental planning assessment and licensing process is still underway, the specific waste disposal options have not been finalised. These options are being considered according to industry best practices. We are happy to keep the community informed, either through the formal consultation process or ongoing conversations as we develop these options.

What is the estimated traffic movements from the Local Water Centre?

The traffic movements from the Local Water Centre will be different during the construction and operation phases. At all times we will be working to minimise the impact on the community of traffic movements. We will maintain a complaints register and have a complaints handling procedure established to respond as quickly as possible.

During construction, traffic movements will include earthmoving equipment and trucks. We estimate the movements per day will be ten trucks.

Once the Local Water Centre is fully operating, we expect there will be one to three truck movements per month and the operator will visit the site in a utility or passenger vehicle two to three times a week.

Our proposal is to dispose of waste as sludge initially through the connection to Hunter Water's sewerage network, which would result in no solids being transported by road. If agreement cannot be reached with Hunter Water, we will remove water from the sludge to create a non-toxic solid waste, which will be removed by trucks. When the Centre is a full capacity in a number of years' time, this could be an additional three truck movements per week to collect solid waste bins.

The Masterplan for Watagan Park considers traffic management to accommodate the new community, ensuring there is plenty of capacity in the road network to access the site. This Masterplan requires the developer to install traffic signals on the intersection connecting Freemans Drive to the new community.

In your application to Council, you have mentioned that this development is scalable. What do you mean by this?

This refers to our plan to build the Local Water Centre in stages. The major construction phase will occur in one stage and then equipment and storage tanks will be added in stages as the new development area is gradually rolled out. The ultimate size and components are as described in the Development Application.

What is the proposed height of the water tanks at the Local Water Centre?

We have been conservative in our application to Council and requested a height approval of seven metres. Similar tanks at our Pitt Town Local Water Centre are four and a half metres high. We will be investigating suggestions made to partially sink the tanks into the hillside with appropriate drainage to reduce their visible height.

Will there be security lighting at the water centre?

There will be some lighting at the site for security but we will design that so it is as minimal as possible, and either shielded or directed away from neighbours as much as possible. The nearest existing neighbour is more than 100m from the proposed site for the Local Water Centre.

How will hazardous chemicals be safely managed on site?

Chemicals needed as part of the treatment process and stored at the site are sodium hypochlorite, magnesium hydroxide, alum (coagulant) and citric acid. These will be kept in regulation tanks, behind a bund wall, according to industry standards. The area where the chemicals will be kept will be locked.

Customer services

Why do we use the terms ‘Local Water Centre’ and a ‘sustainable water network’?

People moving into homes serviced by Cooranbong Water will have more than just the water and wastewater services traditionally offered. Our Local Water Centre and sustainable water network operate differently from those built and operated by Hunter Water and provide additional services. This is why we use different names.

The services include two grades of water for different uses: potable for drinking, bathing and cooking; and refined (recycled) for flushing toilets, to use in the washing machine and for outdoor uses such as irrigation and washing cars.

Every drop of drinking water saved takes pressure off our precious water reserves. Every drop of refined water used is a drop of drinking water saved. The local water network will offer smart and efficient water services tailored to the local community.

Cooranbong Water uses proven technology that is focused on having a smaller environmental footprint and being highly water efficient.

What is refined water? Why don’t you call it recycled water?

There is still limited understanding in the Australian community about different grades of water and what you can use them for. We use the term ‘refined water’ as a product name to help begin the education process about the different qualities of water available and how you can use them appropriately. Our refined water is the highest quality water under the Australian Guidelines for Water Recycling and means it is approved by health authorities to use in washing machines, to flush toilets and irrigate gardens.

There are other grades of recycled water too, such as water that is produced solely for industrial purposes.

Australia is one of the driest continents on earth. Water is a precious resource. We want to start educating the community about being smart about the water they use and how they can reuse it appropriately to save drinking water for our consumption. Houses connected to our sustainable water network will save up to 70 percent of drinking water by using refined water instead.

Why use the highest quality of water, drinking water, to flush your toilet?

Will you be offering your services to other existing residential areas of Cooranbong?

Our local water network is licensed for a specific area, which is the new Watagan Park development area. Cooranbong Water would be happy to assess the feasibility of expanding its licensed area of operations on a case by case basis to service parts of the existing community. As the proposal stands, the existing community will benefit indirectly as new residents using our sustainable water network will not draw on the existing infrastructure and water resources as much as if they were Hunter Water customers. This, particularly combined with the benefits of Flow Systems' other utilities in the region, has the potential to reduce the need for water restrictions across the whole community in drought and to extend the life of Hunter Water's existing infrastructure.

How do you compensate people for damage should there be any problems with your system?

We will have a contract with each customer for our services. This agreement has been reviewed by IPART, the NSW Government regulator of water utilities.

If there is a problem with our equipment that is not caused by a customer, but is a fault of the equipment, then we will repair it at our cost.

In the unlikely event that our system or operations cause damage to a neighbour's property or other third party's property, we would pay the cost of any proven claims.

How long would it take to fix any potential problem?

Our monitoring of the system allows us to see if we have a major leak or any unusual flow patterns. It also shows us where these are if they happen. We will employ local contractors to help maintain the system who will be on call just down the road.

What happens if Flow Systems, the parent company, goes into liquidation?

Financial assessment of Flow Systems and Cooranbong Water is undertaken by the NSW Government as part of the licensing process to ensure Flow Systems and Cooranbong Water have the financial capability and depth to be a viable long-term water utility.

In NSW, the Water Industry Competition (2006) protects the ongoing supply of water services. If Cooranbong Water is unable to provide services, the Minister for Lands and Water can appoint another service provider to protect these services. This is also a condition of the operating and retail licences.

As the number of homes increase at Cooranbong, we are required to establish a sinking fund so that we can renew our facilities and infrastructure. It is part of our legislative requirement to have sufficient funds to maintain our infrastructure so that it continues to operate to suitable standards.

Our other checks and balances include diversifying risks across multiple projects and using proven technology that follows industry standards. We also have a commercial relationship with other providers that can take over the facilities and operate them in the unlikely event of an issue.

Brookfield Infrastructure, one of the world's largest infrastructure companies, is a major shareholder of Flow Systems, the parent company to Cooranbong Water. As of 2014, Brookfield controlled $190 billion worth of infrastructure worldwide.