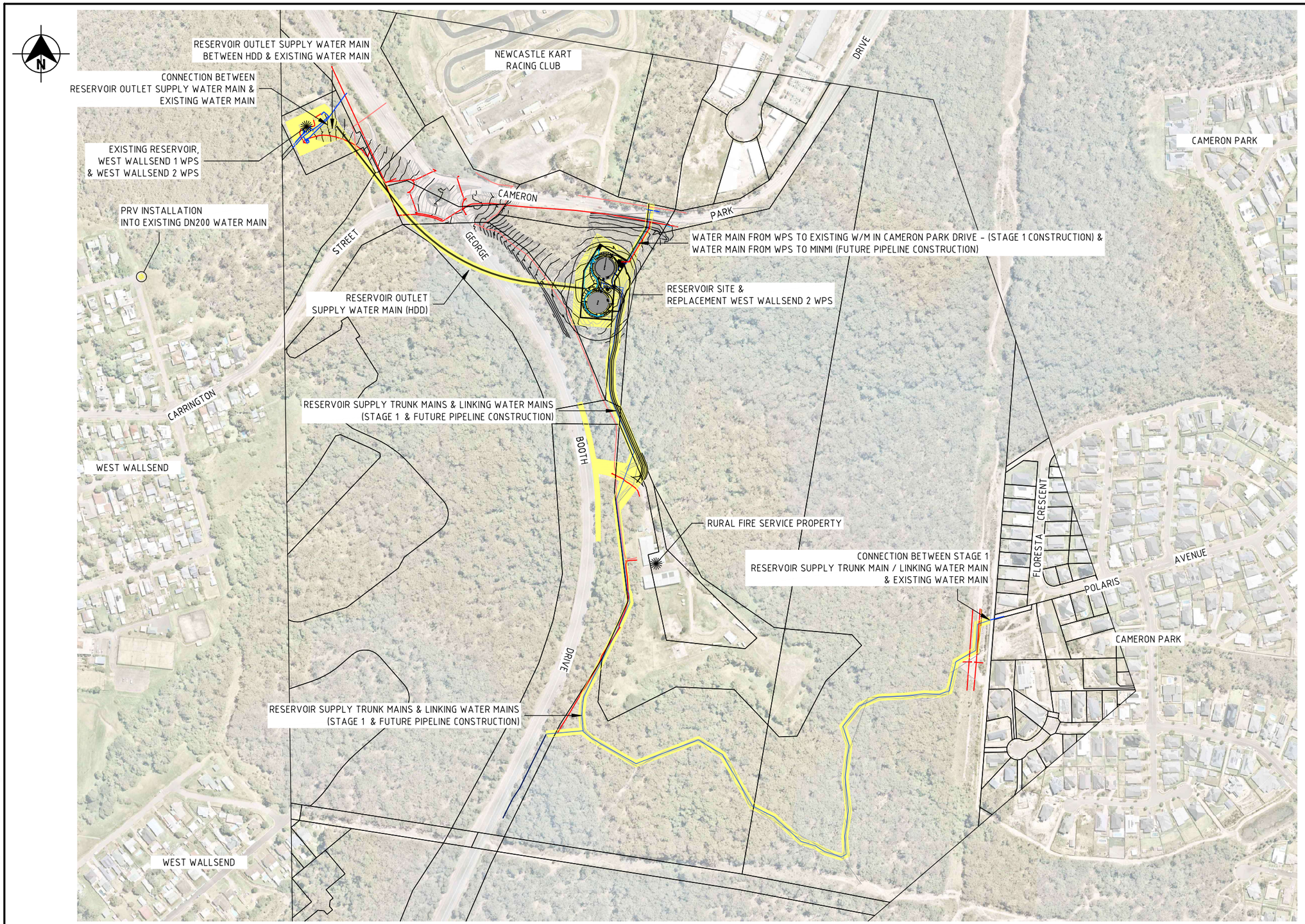
Appendix A Ref Impact Area Drawing



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LEGEND:

- WATER MAIN
- HV — HV ELECTRICITY (U/G)
- OHP — ELECTRICITY (O/H)
- W — EXISTING WATER MAIN
- OHP — EXISTING ELECTRICITY (O/H)
- LV — EXISTING ELECTRICITY (U/G)
- OFC — EXISTING TELECOMMUNICATIONS (OFC)
- SW — EXISTING STORMWATER
- IMPACT AREA

No.	REVISION DETAILS	DWN	DATE
A	INFORMATION	CT	21/06/22

VERSION 4

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Hunter H2O Holdings Pty Limited
ABN 16 602 201 552

CONSULT. REFERENCE No. 10156

HUNTER WATER

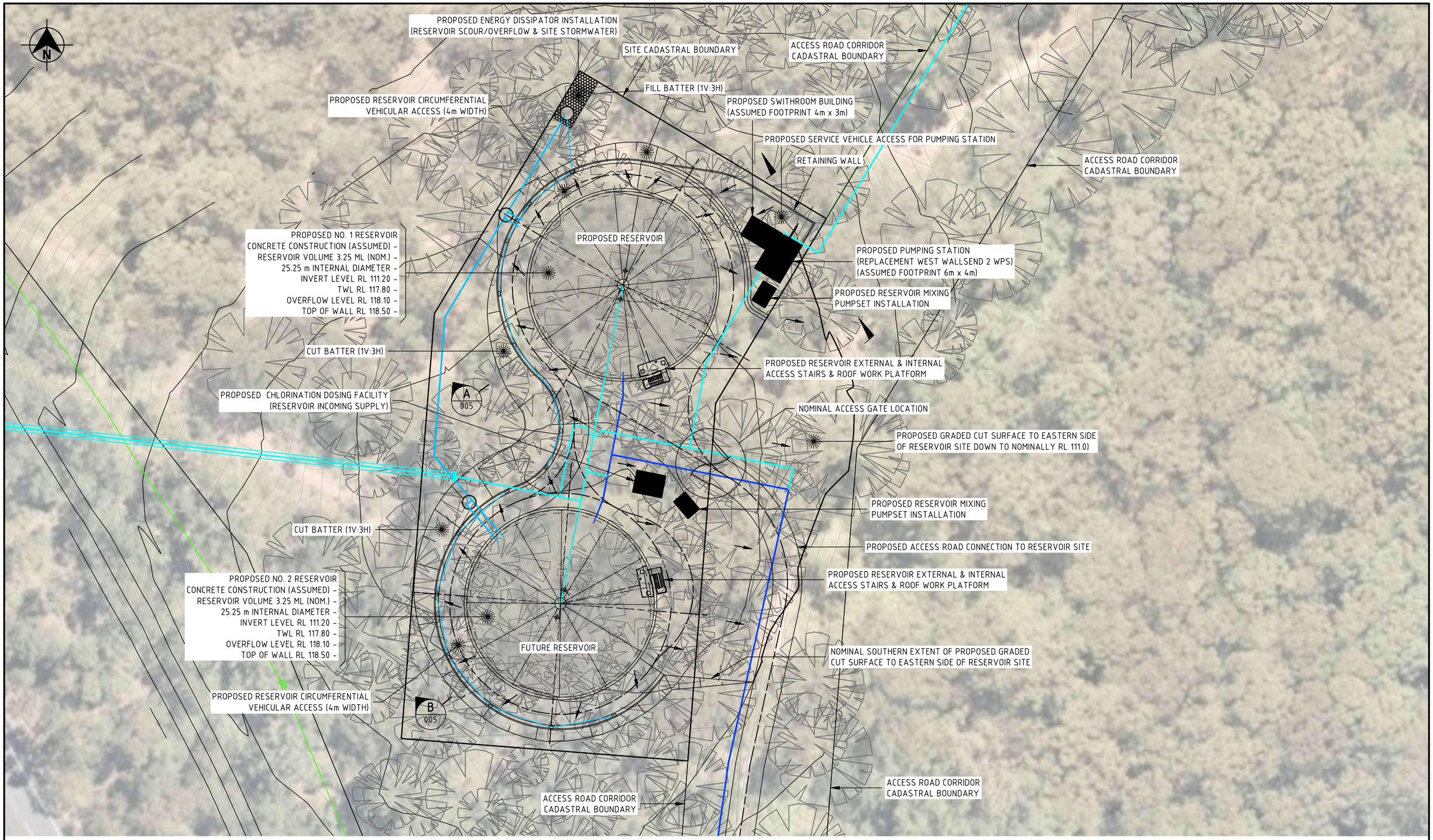
DESIGNED: –	DATE: –	COMPANY: –	
DRAWN: –	DATE: –	COMPANY: –	
CHECKED: –	DATE: –	COMPANY: –	
APPROVED: –	DATE: –	COMPANY: –	

TITLE:
CS1175 - SR00156
CAMERON PARK RESERVOIRS
WR-CRE-001 RES AND WR-CPE-002 RES
CONCEPT DESIGN
'REF IMPACT AREA'

SIZE:	SCALE:	INDEX No.	DRAWING No.	SHEET	REV No.
A3	1:5000		–	–	A

Plot Date: 22/06/22 - 08:49 Cad File: P:\HWC\10000 HWC Partnership\10156 Cameron Park Reservoir\2. Tasks\4. Survey and Services Location\2. Current Working\(REF IMPACT AREA).dwg

Appendix B Reservoir Site Plan



NOTES:

1. FOR RESERVOIR SITE PIPEWORK CONCEPT ARRANGEMENT REFER DRG -006.

PRELIMINARY ISSUE
NOT FOR CONSTRUCTION

No.	REVISION DETAILS	DWN	DATE
A	DRAFT	DC	02/03/22

VERSION 4

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HUNTER WATER

DESIGNED: JS	DATE: 02/03/22	COMPANY: HH2O	
DRAWN: DC	DATE: 02/03/22	COMPANY: HH2O	
CHECKED:	DATE:	COMPANY:	
APPROVED:	DATE:	COMPANY:	

TITLE:
CS1175 - SR00156
CAMERON PARK RESERVOIRS
WR-CRE-001 RES AND WR-CPE-002 RES
CONCEPT DESIGN
RESERVOIRS 1 & 2 CONCEPT ARRANGEMENT PLAN

SIZE:	SCALE:	INDEX No.	DRAWING No.	SHEET	REV No.
A3	1:500		16258	004	0A

Plot Date: 03/03/22 - 16:12 Cad File: P:\HWC\10000 HWC Partnership\10156 Cameron Park Reservoir\2. Tasks\4. Survey and Services Location\2. Current Working\16258-001 to -006 (Reservoir Arrangements).dwg

Appendix C Consultation

From: Greg Moore
To: David Mantle; Josh Plummer; Marnie Coates
Subject: FW: Cameron Park Res CFD modelling
Date: Monday, 30 May 2022 12:03:12 PM
Attachments: image002.png
image004.png
image005.png
image006.png
image007.png
image009.jpg
image010.jpg
image011.jpg
image012.jpg
image013.jpg
image014.jpg
image015.png
image003.png
image016.png

More comments below from LMCC about CPR.
Greg

From: Robbie Economos <reconomos@lakemac.nsw.gov.au>
Sent: Tuesday, 29 March 2022 4:20 PM
To: Andrew Day <ADay@rochegroup.com.au>
Cc: Carlos Ferguson <cferguson@lakemac.nsw.gov.au>; John Eaton <jeaton@lakemac.nsw.gov.au>; Greg Moore <greg.moore@hunterwater.com.au>
Subject: RE: Cameron Park Res CFD modelling

Hi Andrew

Council has been discussions with Hunter Water directly about this as there is also Council land involved.

From the concept plan Council has viewed so far there appear to be some impacts on the Hammersmith offset site from:

- the proposed works on the reservoir site (indirect impacts and maybe direct from the construction on the boundary),
- direct clearing on the offset from the western segments of the proposed reservoir supply trunk main and linking water main
- direct impacts if clearing is required in addition to the 3.5m (Cat 7) bushfire access width that is required for the fire trail
- direct impacts from clearing for the proposed reservoir outlet supply pipeline
- indirect impacts from the crown road access trail (including clearing, ongoing access off Cameron Park Drive, erosion and sediment yield etc)

So at this point these impacts need to be quantified and the extent to which the disturbed area can be rehabilitated assessed. It is unclear what will happen within the easement once the pipeline is installed – Council is assuming full native vegetation rehabilitation will not be possible but this might not be the case.

Measures will need to be undertaken to ensure the quantum and quality of the native vegetation offset on the offset land remains the same as agreed with Hammersmith and within the intention of the Planning Agreement (i.e. offset the disturbed offset lands). Whilst the planning agreement allows easements the quantum and quality of native vegetation on the offset site and mapped at the time of the planning agreement needs to be provided and managed accordingly.

Native vegetation rehabilitation should aim for a self-maintaining state. Ways of offsetting the areas that will be permanently cleared will be discussed with Hunter Water once we have some idea of the extent of this impact.

Please also bear in mind that the management plan for the offset site (that is in operation for around 9-10 years) will need to be updated to deal with the increased edge impacts (or an additional compatible management plan prepared separately for this project) and additional edge impacts may increase management costs when these are calculated in the future (i.e. upon dedication to the land to Council).

Please note that the proposal is still being designed, discussions with Hunter Water are continuing and a review of environmental factors will be required to be prepared for the works. Methods such as under boring would make a big difference in avoiding impact. So the impacts outlined above could change.

Regards

Robbie Economos
Environmental Planner

T +61 2 4921 0312
E reconomos@lakemac.nsw.gov.au
lakemac.com.au

From: Andrew Day <ADay@rochegroup.com.au>
Sent: Monday, 14 March 2022 12:08 PM
To: Greg Moore <greg.moore@hunterwater.com.au>; David Mantle <david.mantle@hunterwater.com.au>
Cc: Carlos Ferguson <cferguson@lakemac.nsw.gov.au>; Robbie Economos <reconomos@lakemac.nsw.gov.au>; Adam Shaw <adam@gca.net.au>; Wes van der Gardner <wes@rochegroup.com.au>
Subject: FW: Cameron Park Res CFD modelling

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Hi Greg/David,

Please see preliminary response below from council.

We are still waiting on advice from Robbie Economos (LMCC) to finalise a response, however we have no comments on the design's interaction (in concept) with the DN200 watermain we are delivering in GBD. Obviously, there is little detail to comment upon at this stage given the connection main size, material, connection arrangement etc is all to be determined in "detail design phase"….

We will provide our final response following final liaison with LMCC regarding the proposed alignment in the offset area.

Regards,

ANDREW DAY
Senior Development Manager
ROCHE GROUP PTY LIMITED
Office: 365 New South Head Road, Double Bay NSW 2028
Post: P.O. Box 325, Double Bay NSW 1360
Mobile: 0490 863 626
Email: aday@rochegroup.com.au
Web: rochegroup.com.au
Roche Group Pty Limited

From: Carlos Ferguson <cferguson@lakemac.nsw.gov.au>
Sent: Monday, 14 March 2022 11:55 AM
To: Andrew Day <ADay@rochegroup.com.au>; Robbie Economos <reconomos@lakemac.nsw.gov.au>
Subject: RE: Cameron Park Res CFD modelling

Hi Andrew,

Thanks for sending the plan through, I have reviewed the plans and do not have any particular concerns re works on Council's land/fire station at 1A George Booth Dr (Lot 1 DP 367540 and Lot 1 DP 961707).

Based on our previous discussions, it still appears that the proposal will require:

- An easement over Hammersmith land (6 Cameron Park Dr) for new pipelines
- Easement over Council land/fire station site – noting this land has been verified as Operational, which makes it a lot easier.
- Note the Remainder of works are either within Hunter Waters site or road reserve

I believe Robbie is still completing her review of the proposal against the VPA, and wont be back in the office until the 21/3/21.

I hope this advice is of assistance, but please give me a call if you have any questions.

Kind regards,

Carlos Ferguson
Property Contracts Officer

T +61 2 4921 0235
E cferguson@lakemac.nsw.gov.au
lakemac.com.au

From: John Eaton
Sent: Tuesday, 8 March 2022 2:07 PM
To: Andrew Day <ADay@rochegroup.com.au>; Robbie Economos <reconomos@lakemac.nsw.gov.au>
Cc: Carlos Ferguson <cferguson@lakemac.nsw.gov.au>; David Pavitt <dpavitt@lakemac.nsw.gov.au>; Wes van der Gardner <wes@rochegroup.com.au>
Subject: RE: Cameron Park Res CFD modelling

Hi Andrew – it is not my call to make a decision on this one - I have referred it onto Carlos, Robbie and others to determine what may be appropriate under the terms of the VPA. FYI - Robbie has also had discussions about this issue with Greg Moore in the past.
Cheers
John

John Eaton
Vegetation Establishment Officer

T +61 2 4921 0524
E jeaton@lakemac.nsw.gov.au
lakemac.com.au

From: Andrew Day <ADay@rochegroup.com.au>
Sent: Tuesday, 8 March 2022 8:12 AM
To: John Eaton <jeaton@lakemac.nsw.gov.au>
Cc: Carlos Ferguson <cferguson@lakemac.nsw.gov.au>; David Pavitt <dpavitt@lakemac.nsw.gov.au>; Wes van der Gardner <wes@rochegroup.com.au>
Subject: FW: Cameron Park Res CFD modelling

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Hi John,

Please see attached Hunter Waters proposed alignment for their Cameron Park Reservoir. They have advised that they are utilising existing tracks (hence the alignment), however it obviously requires some clearing.

Can you please review and confirm councils acceptance in regard to the alignment in light of this being an offset area?

Regards,

ANDREW DAY
Senior Development Manager
ROCHE GROUP PTY LIMITED
Office: 365 New South Head Road, Double Bay NSW 2028
Post: P.O. Box 325, Double Bay NSW 1360
Mobile: 0490 863 626
Email: aday@rochegroup.com.au
Web: rochegroup.com.au
Roche Group Pty Limited

From: Greg Moore <greg.moore@hunterwater.com.au>
Sent: Tuesday, 8 March 2022 7:55 AM
To: Andrew Day <ADay@rochegroup.com.au>; adam@gca.net.au; Carlos Ferguson <cferguson@lakemac.nsw.gov.au>
Cc: David Mantle <david.mantle@hunterwater.com.au>
Subject: Cameron Park Res CFD modelling

Hi,
Please find attached the draft concept design for the Cameron Park Reservoir design.
Please review and let David Mantle or myself know if you have any comments. Typically HWC operates on a 1 week review period.

I am available this week, after this week, please forward your comments to David.

Gregory Moore BE(Mech) MBA(Newc)
Hunter Water Corporation
36 Honeysuckle Drive Newcastle NSW 2300 | PO BOX 5171 HRMC NSW 2310
T 02 4979 9732 | M 0438 502 932 | Twitter: @hunterwater
greg.moore@hunterwater.com.au | hunterwater.com.au
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From:	Greg Moore
To:	David Mantle; Josh Plummer; Marnie Coates
Cc:	Greg Moore
Subject:	FW: Council response to Cameron Park Res CFD modelling
Date:	Monday, 30 May 2022 12:00:56 PM
Attachments:	image015.png image016.png image017.png image018.png image020.jpg image021.jpg image022.jpg image023.jpg image024.jpg image025.jpg image026.png image001.png

---

Hi,
Did the CPR project team receive the comments below?

From: Carlos Ferguson <cferguson@lakemac.nsw.gov.au>
Sent: Tuesday, 29 March 2022 12:32 PM
To: Greg Moore <greg.moore@hunterwater.com.au>
Subject: Council response to Cameron Park Res CFD modelling

Hi Greg,

As discussed, we have consulted with our Environmental and Development Engineering sections, and after review of the plans you forwarded would like to provide the following comments:

- Easements proposed over Council land. While no objections are raised in principle to the easements, its noted:
    - Rural Fire Service site is Operational
    - 24 Cameron Park Dr (Lot 3 DP 1134639) is Community Land, which requires public notification of any easements for a period of 28 days. Council will be able to commence public notification and preparation of a deed of agreement for works on Council land once we have some easement plans.
- Note easements are also proposed over land currently owned by Hammersmith. This will need to be resolved with them as part of the project planning.
- We are assuming Hunter Water will be relying on its powers of entry to undertake works within the road reserve, and a Section 138 Roads Act approval will not be required.
- No objection were raised in principle to the access connection to the RFS entry, but the detailed design should be provided to Council prior to works for review.
- The stormwater design within Hunter Waters land will need to ensure it doesn't impact adjoining Hammersmith land.

Regarding the environmental aspects, its noted the attached plan has taken on board a number of Council's (Robbie Economos) previous comments by

- Co locating the majority of the proposed reservoir supply trunk main and linking water main with the fire access track on council land and in the approved management plan for the offset site, within the RSF site and within the crown road reserve.
- Restricting direct impacts from construction and batters for the tanks within the proposed HW reservoir site.

However, there remain some impacts on the Hammersmith offset site from

- the proposed works on the reservoir site (indirect impacts and maybe direct from the construction on the boundary),
- direct clearing on the offset from the western segments of the proposed reservoir supply trunk

main and linking water main
- direct impacts if clearing is required in addition to the 3.5m (Cat 7) bushfire access width that is required for the fire trail
- direct impacts from clearing for the proposed reservoir outlet supply pipeline
- indirect impacts from the crown road access trail (including clearing, ongoing access off Cameron Park Drive, erosion and sediment yield etc)

There are also some impacts from the pipeline on Council Conservation C2 land that include any clearing in addition to the 3.5m (Cat 7) bushfire access width that is required for the fire trail.

So at this point these impacts need to be quantified and the extent to which the disturbed area can be rehabilitated assessed. It is unclear what will happen within the easement once the pipeline is installed – Council is assuming full native vegetation rehabilitation will not be possible.

Measures will need to be undertaken to ensure
- cleared and disturbed Council C2 Conservation land is compensated for and rehabilitated
- the quantum and quality of the native vegetation offset on the offset land remains the same as agreed with Hammersmith and within the intention of the Planning Agreement (i.e. offset the disturbed offset lands). Whilst the planning agreement allows easements the quantum and quality of native vegetation on the offset site and mapped at the time of the planning agreement needs to be provided and managed accordingly.

Native vegetation rehabilitation should aim for a self-maintaining state. We can discuss ways of offsetting the areas that will be permanently cleared once we have some idea of the extent of this impact. Adding parts of the crown roads to the offset site is one possibility – there may be others.

Please also bear in mind that the management plan for the offset site (that is in operation for around 9-10 years) will need to be updated to deal with the increased edge impacts (or an additional compatible management plan prepared for this project) and additional edge impacts will increase in perpetuity management costs when these are calculated in the future (i.e. upon dedication to the land to Council). Robbie will send the management plan through for your consideration under separate cover.

We hope this advice is of assistance, but if you have any questions or wish to discuss it further, please don't hesitate to contact me.

Kind regards,

Carlos Ferguson
Property Contracts Officer

T +61 2 4921 0235
E cferguson@lakemac.nsw.gov.au
lakemac.com.au

From: Greg Moore <greg.moore@hunterwater.com.au>
Sent: Tuesday, 8 March 2022 7:55 AM
To: Andrew Day <ADay@rochegroup.com.au>; adam@gca.net.au; Carlos Ferguson <cferguson@lakemac.nsw.gov.au>
Cc: David Mantle <david.mantle@hunterwater.com.au>
Subject: Cameron Park Res CFD modelling

Hi,
Please find attached the draft concept design for the Cameron Park Reservoir design.
Please review and let David Mantle or myself know if you have any comments. Typically HWC operates on a 1 week review period.

I am available this week, after this week, please forward your comments to David.

Gregory Moore BE(Mech) MBA(Newc)
Hunter Water Corporation
36 Honeysuckle Drive Newcastle NSW 2300 | PO BOX 5171 HRMC NSW 2310
T 02 4979 9732 | M 0438 502 932 | Twitter: @hunterwater
greg.moore@hunterwater.com.au | hunterwater.com.au
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From: subsidencedevelopment
To: Michael Calder
Cc: subsidencedevelopment
Subject: RE: Project Enquiry - Cameron Park Reservoir
Date: Friday, 24 December 2021 11:27:31 AM
Attachments: image001.png
image002.png
image003.png
image004.png
image005.png
image006.png
image007.png
image008.png
image009.jpg
image010.png

Hi Michael,

Thank you for your enquiry regarding a Reservoir at Cameron Park and other works, our ref: **EOTH21-00388**.

Subsidence Advisory NSW (SA NSW) records indicate majority of the works along the proposed alignment are undermined by historic workings in the Borehole Seam with depths of cover ranging from 160 to 230m. These workings are a mixture of bord and pillar first workings and pillar extraction workings. Our records indicate the reservoir site is undermined by pillar extraction workings at depths from approximately 195 to 205m.

A mining lease also exits under the site. SA NSW have received previous advice from the lease holder that there are no plans for further coal extraction in this area.

We would be happy to have a meeting in the new year to discuss the project in the context of SA NSW's assessment policies for development applications.

When plans for the project are ready, an application should be submitted to SA NSW via our online portal.

Regards,

Shane McDonald | Senior Risk Engineer
Subsidence Advisory NSW
Better Regulation Division | Department of Customer Service
P: 4908 4300
E: subsidencedevelopment@customerservice.nsw.gov.au | www.subsidenceadvisory.nsw.gov.au

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To comply with the NSW Public Health Orders, Subsidence Advisory NSW's office counters are currently closed and our staff are working from home.

We are continuing to process claims and applications, however, there may be some delays to our usual processing timeframes. We thank you for your patience during this time.

From: Michael Calder <Michael.Calder@aurecongroup.com>
Sent: Tuesday, 14 December 2021 10:37 AM
To: subsidenceadvisory <subsidenceadvisory@customerservice.nsw.gov.au>
Subject: Project Enquiry - Cameron Park Reservoir

Hi there,
We are assisting Hunter H20 and Hunter Water with a proposed new Reservoir at Cameron Park, and are currently scoping the geotechnical investigation. The project is currently at concept stage.
As such we are looking to begin the mine subsidence enquiry on our clients behalf.
Some details on the project:

- The existing West Wallsend 1 Hydro/WPS and West Wallsend 1 Reservoir (just north of the intersection of George Booth Drive and Cameron Park Drive) are to be decommissioned and demolished. A new Pressure Reducing Valve (PRV) will be installed at this site (shown below).
- A new water main system will be installed using Horizontal Directional Drilling (HDD) from the PRV to the proposed new reservoir site (shown in blue below below). This will underbore both Carrington Street and George Booth Drive.
- Two new 3.25ML Reservoirs will be installed at the proposed Reservoir location (shown in yellow below).
- New gravity main from the reservoir site to the existing network at Floresta Crescent (shown in purple below). This will be a trenched pipe.
- The orange line on the below figure shows an approximation of the current preferred alignment, so I have added approximate 50m offsets (blue and purple polygons).

Please let me know if there is any other information you require.
Cheers,
Michael Calder B.Eng (Honours) (Civil)
Geotechnical Engineer, Aurecon
M +61 402 524151
Michael.Calder@aurecongroup.com
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aurecongroup.com

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Appendix D Aboriginal Cultural Heritage Assessment Report

HERITAGE NOW
VALUING OUR PAST - CREATING OUR FUTURE

Project Number: HN000314-A

ABORIGINAL CULTURAL HERITAGE ASSESSMENT REPORT– CAMERON PARK RESERVOIR AND WATER SUPPLY UPGRADE

PENDING REVIEW BY ABORIGINAL COMMUNITY

DRAFT 1 / 06 / 2022

JM ENVIRONMENTS
37 Tooke Street, Cooks Hill, 2300, Newcastle, NSW

REPORT BY HERITAGE NOW PTY LTD
projects@heritagenow.com.au
(02) 8318 9770
www.heritagenow.com.au

Executive Summary

Heritage Now Pty Ltd (Heritage Now) was engaged by JM Environments, for Hunter Water Corporation (Hunter Water), to undertake an Aboriginal Cultural Heritage Assessment (ACHA) report addressing a proposed water reservoir at West Wallsend/Cameron Park.

The Project Area contains one AHIMS site that has cultural and archaeological values: AHIMS site 38-4-0989. It is representative of Aboriginal sites on a local level; however, the site is not rare and is of low research and educational potential. Overall, the site has low significance on a local and regional scale.

The location of AHIMS Site 38-4-0989 was ground-truthed, but none of the seven associated artefacts were identified during survey. This is most likely due to splash and sheet erosion having likely moved the artefacts, or since recording they have been covered by additional leaf litter and vegetation. No additional sites or PADS were identified in the Project Area. However, this location is still protected under the *National Parks and Wildlife Act 1974* and thus an Aboriginal Heritage Impact Permit (AHIP) is required.

The following recommendations are to be followed.

Recommendation 1

This ACHA report is to be used as part of an AHIP application for community collection of AHIMS 38-4-0989 and other actions causing harm. The AHIP must be approved and required heritage works undertaken before the commencement of ground disturbing works on the site. The ongoing AHIP conditions are to also to be abided by for the duration of the project.

Recommendation 2

The processes outlined in the below table are to be followed for the proposed works.

Mitigation and Measures	When it occurs	What occurs (summary)
Apply for Aboriginal Heritage Impact Permit from Heritage NSW	At least three months before intended ground disturbance start date	To be organised with heritage consultant by HWC or their contractor.
Community Collection	Post-AHIP approval and before works commence onsite	Removal of vegetation (cultural burn or hand-clearing) organised by HWC, followed by collection of Aboriginal artefacts by archaeologist and RAP team.
Artefact Storage and Ongoing Curation	Following collection of artefacts	Artefacts stored by archaeologists at Heritage Now office whilst a permanent location for artefacts is confirmed with RAPs. Heritage Now archaeologists, on behalf of HWC, organise either reburial of artefacts or the delivery of artefacts into a Care and Control agreement with a RAP group.
AHIP works to be documented	Following artefact collection	The heritage consultant is to provide a report documenting the heritage works

Mitigation and Measures	When it occurs	What occurs (summary)
		undertaken under the AHIP and fill out the relevant Aboriginal Site Impact Recording (ASIR) forms.
Heritage Induction	Post-AHIP approval before works commence onsite (ideally first day of site works)	Heritage Now personnel deliver a cultural heritage induction to site workers on the first day or works. A copy of this induction will be provided to the works foreman to deliver to any additional workers.
Unexpected Finds Procedure	Included within Heritage Induction	Processes for the recovery of unexpected finds (including human remains) communicated to site workers through the heritage induction.
Unexpected Finds Procedure—Human Remains	Included within Heritage Induction	Processes for the recovery of unexpected finds (including human remains) communicated to site workers through the heritage induction.

Acronyms and Definitions

Acronym/Term	Definition
Aboriginal object	Aboriginal object means any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises New South Wales, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains (as per *NPW Act 1974*).
Aboriginal place	Any place declared to be an Aboriginal place under Section 84 of the NPW Act.
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System (register for Aboriginal sites in NSW)
AHIP	Aboriginal Heritage Impact Permit (as per NPW Act 1974)
A Horizon	The top layer of mineral soil in a soil profile. It is usually broken into A_1 and A_2 soils, with the former tending to have a relatively high dark organic content, while the latter is paler.
B Horizon	The B horizon underlies the A horizon of a soil profile, and is generally a high-clay content soil.
DCDB	Digital Cadastral Database (NSW)
DECCW	Department of Environment, Climate Change and Water, NSW (became the Office of Environment and Heritage in 2011).
DP	Deposited Plan
DTDB	Digital Topographic Database (NSW)
EP&A Act	Environmental Planning and Assessment Act (1979)
GPS	Global Positioning System
Holocene	Geological epoch (period) typically defined as the time period that commenced approximately 11,700 years ago and is the current period of geological time. This period is generally warmer and wetter than the preceding Pleistocene period.
LALC	Local Aboriginal Land Council (Land Council under the Aboriginal Land Rights Act 1983)
LGA	Local Government Area
OEH	Office of Environment and Heritage, NSW (Now Heritage NSW)
m	Metric metres

Non-perennial	In terms of waterways, it means a waterway that is usually partially or fully dry for part of the year.
NPW Act	National Parks and Wildlife Act 1974
PAD	Potential Archaeological Deposit
Perennial	In terms of waterways, it means a waterway that has year-round water.
Pleistocene	Geological epoch (period) is typically defined as the time period that commenced approximately 2.6 million years ago and lasted until approximately 11,700 years ago. This period spans the world's recent period of repeated glaciations. The late Pleistocene, in which humans began occupying Australia, is generally colder and dryer than the Holocene.
RAPs	Registered Aboriginal Parties (Aboriginal organisations and individuals who were consulted for the Project following Aboriginal Cultural Heritage Consultation Requirements for Proponents)
REF	Review of Environmental Factors
SIX Maps	Spatial Information Exchange (NSW government portal holding a range of spatial and property data)

Version Control

Version	Date	Reviewer	Revision Description
Draft 1	10/03/2022	Tessa Boer-Mah, Principal Heritage Consultant	Draft for client review
Draft 2	30/05/2022	Tessa Boer-Mah, Principal Heritage Consultant	Updates following client review, draft 2 for Aboriginal Community Consultation
Draft 3	24/06/2022	Lara Tooby, Heritage Consultant	Inserting amended plans
Final			Updates following review by RAPs review

Contents

Tables

Figures

Plates

1 Introduction

Heritage Now Pty Ltd (Heritage Now) was engaged by JM Environments on behalf of Hunter Water Corporation (Hunter Water), to undertake an Aboriginal Cultural Heritage Assessment (ACHA) report addressing a proposed water reservoir and associated water infrastructure at West Wallsend/Cameron Park.

This report is a combination of an Aboriginal Cultural Heritage Assessment (ACHA) and an Archaeological Report (AR) [1] as per Heritage NSW guidelines. The key objective of this assessment is to identify cultural heritage values through consultation with Registered Aboriginal Parties (RAPs) and archaeological investigation.

1.1 Project Area

The Project Area is located in Cameron Park and West Wallsend (Figure 1) and encompasses six lots (Table 1). The northern-most portions of the Project Area are north-west and west of the intersection of Carlington Street, George Booth Drive and Cameron Park Drive. It then runs parallel to George Booth Drive towards the intersection with Wallsend Road, at which point it turns east for approximately 500 metres.

The Project Area is located approximately 1.8 km east of the town of West Wallsend (Figure 2) and is within the boundaries of Lake Macquarie Local Government Area (LGA) and the Awabakal Local Aboriginal Land Council (LALC).

Table 1. Lots and DPs encompassed by Project Area.

Lot	DP
1	923578
1	1156170
1	367540
2999	1260247
3	1134639
106	1000408

[1] Although it is recommended in the *Code of Practice* that an Archaeological Report should be a stand-alone technical report, due to the test excavation not occurring, a combined report assessed as appropriate for this project and AHIP. The technical aspect of the report, documenting the archaeological survey, is found in Section 5.

Figure 1. The Project Area. It is in Zone 56 and Parish of Teralba. (Source: SIX Maps aerial, DCDB data, and Heritage Now additions) (Source: Six Maps with Heritage Now additions).

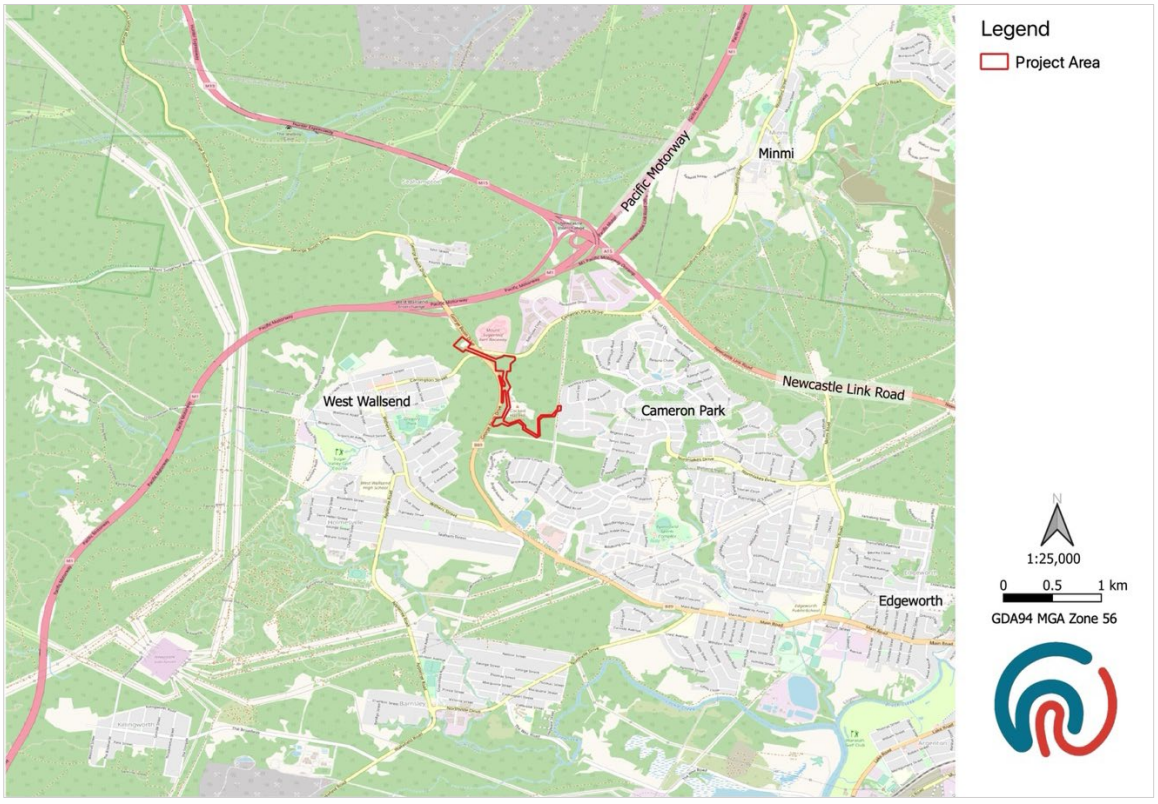


Figure 2. The Project Area in a regional context. (Source: Six Maps with Heritage Now additions).

1.2 Proposal

The West Wallsend/Edgeworth/Minmi area is part of the West Lake Macquarie Water System. It is Lake Macquarie's main area of residential development in the short to medium term. Approximately 7,300 new residential properties are expected to be developed from two major developments; Northlakes and Minmi.

With the impending growth of residential development within the West Wallsend/Edgeworth area, Hunter Water Corporation (HWC) has prepared a regional servicing strategy in 2018. This strategy identified network augmentation required for increased capacity to service the planned growth. The recommended option comprises of a new 6.5ML reservoir storage site, new trunk mains (water mains) that will link the Cameron Park 2 Zone and the West Wallsend area via a new pressure reducing valve (PRV) (Figure 3). The new system will be able to service West Wallsend including the elevated areas fed by gravity from the new Cameron Park Reservoirs. Cameron Park 2 WPS will feed the new reservoirs.

The reservoir site will be constructed in a staged approach. The first reservoir, Cameron Park 1 Reservoir, of 3.25ML will service growth to 2030. The second reservoir, Cameron Park 2 Reservoir, of 3.25ML will service growth beyond 2030. As detailed within the Review of Environmental Factors (REF) for the proposal, the location of the proposed works was carefully considered; a number of options were considered, with the current location chosen as it provides better trenchability, future maintenance access and manageable environmental impacts along an established fire trail.

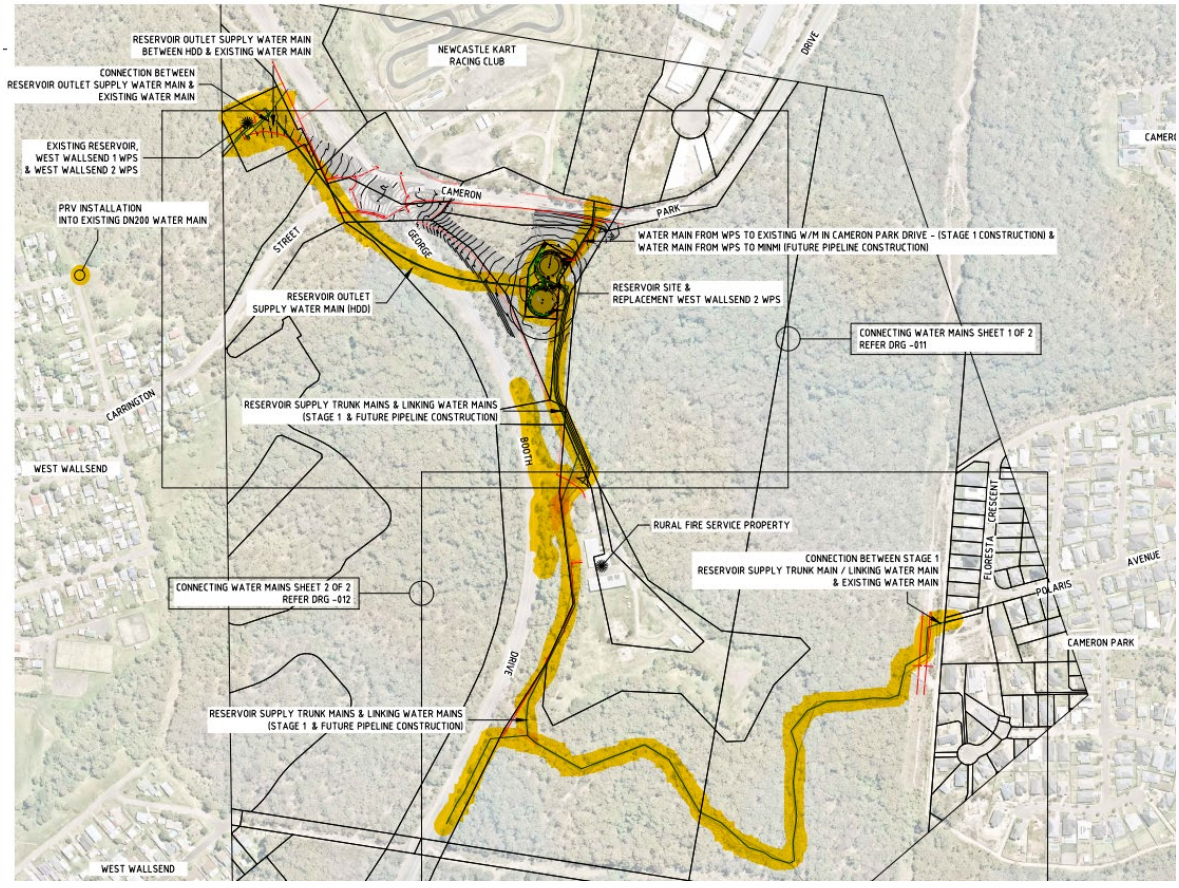


Figure 3. Excerpt from plans of works. (Source: Client)

1.3 Project Methodology

This ACHA report has been prepared in accordance with, but not limited to, the *National Parks and Wildlife Act 1974*, the National Parks and Wildlife Regulations 2009, the *Environmental Planning and Assessment Act 1979,* the Environmental Planning and Assessment Regulation 2021, Cessnock Local Environmental Plan (LEP), and the State Environmental Planning Policies, particularly the State Environmental Planning Policy (Transport and Infrastructure 2021). The following guidelines and codes of practice have been used in preparing this ACHA report:

- Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (OEH 2011)
- Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW 2010a).
- Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW (DECCW 2010b)

This report will be used as supporting documentation for an Aboriginal Heritage Impact Permit (AHIP) application. Key information required to meet this objective is shown in Table 2.

Table 2. The location in the report of key information required as part of the ACHA process and for AHIP determinations

ACHA and AHIP Requirements	***Report Section / Location***
Introduction	
Description of the proposed activity.	Section 1.2 and Section 7.1
Description of the area where the proposed activities are to be undertaken, including Lot, DP, zone and parish, and any exclusion areas.	Section 1.1 and Figure 1
Identify who owns the copyright to the report, who prepared and contributed to the report and archaeological investigations, and the circumstances under which the report was prepared.	Section 1.4
Legislative Context	
Outline of the relevant statutory controls, including the development context applicable to the site	Section 2
Aboriginal Consultation	
Document consultation with Aboriginal people regarding the Aboriginal objects or Aboriginal place that are the subject of the permit, including submissions made by Aboriginal people, a list of the registered Aboriginal parties, and copies of the submissions received, issued raised and responses.	Section 3
Review of Background Information	
Review the physical setting or landscape (landscape context) of the Project Area, considering (at least) landforms and topography, geomorphic activities, geology, hydrology, soils and land-use history.	Section 4.1
Review and synthesis of known archaeology and ethnohistory in	Section 4.2

ACHA and AHIP Requirements	*Report Section / Location*
the region, including an examination of recorded AHIMS sites within and around the Project Area.	
Map showing location of previously recorded sites and, where available, areas of previous investigations.	Figure 7 and Figure 8
Summarise and discuss the local and regional character of Aboriginal land-use and its material traces	Section 4.3
Predict the nature and distribution of evidence	Section 4.4
Archaeological Survey	
Describe the applied survey sampling strategy	Section 5.1
Analyse survey coverage	Section 5.1
Present survey results	Section 5.2
Significance Assessment	
A statement of significance of the Aboriginal objects or Aboriginal places that are the subject of the permit	Section 6.4
Map of the Aboriginal cultural heritage values present and the elements of the landscape associated with those values	Figure 10
Impact Assessment and Mitigation	
Description of actual or likely harm to the Aboriginal objects or Aboriginal place that is the subject of the permit.	Section 7
Indication of whether any other AHIPs have been issued or refused relating to the Project Area	Section 4.2.4
A clear statement justifying the objectives of the proposed activity	Section 1.2 and Section 7.1
Discussion of considered alternatives considered	Section 1.2
Consideration of ecologically sustainable development (ESD), including cumulative impacts	Section 7.5
Practical measures that may be taken to avoid or mitigate any actual or likely harm to the Aboriginal objects or Aboriginal place that are subject of the permit.	Section 7.3 and Section 7.4
Identification of restricted or confidential information	Section 1.4
Indicate the proposed term of the AHIP	Section 7.4
Topographic map of Project Area showing land to which AHIP applies, showing clear cadastre information including lot and DP, local government area, parish and zone (as applicable).	Figure 11
Conclusions and Recommendations	
Clear and succinct summary of what is being proposed and all commitments made in the report	Executive Summary and Section 8
Other Supporting AHIP Documents	
AHIP application form	AHIP Application Package

ACHA and AHIP Requirements	*Report Section / Location*
Copy of development consent or other approval	AHIP Application Package
AHIP area in JPEG,	AHIP Application Package
AHIP area as GIS shapefile (either ESRI Shapefile; ESRI File geodatabase; Map info TAB file; KML)	AHIP Application Package
ACHAR cover sheet, with signed indemnity.	AHIP Application Package

1.4 Authorship, Copyright and Confidentiality

This report has been produced by the Heritage Now team. The report was written by Lara Tooby (Heritage Consultant) with input from Sarah Mané (Heritage Consultant) and Cathy Villamor (Heritage Officer). Technical input and quality review has been provided by Tessa Boer-Mah (Principal Heritage Consultant) at Heritage Now.

There is no restricted information associated with this report and no confidential information (other than RAPs who do not want their details released);

Heritage Now Pty. Ltd. retains the copyright of this report.

2 Legislative Context

This section provides an outline of the Acts, Regulations and guidelines under which this assessment was undertaken. It is for information purposes only and should not be taken as legal advice.

2.1 National Parks and Wildlife Act 1974

This Act contains the provisions for protecting Aboriginal objects in NSW. Aboriginal objects are protected regardless of whether they are in their original context (location) or not, and it is an offence to harm an Aboriginal object regardless of whether you know it is an Aboriginal object or not. Protection under Section 86 of the Act is as follows:

- s86(1) A person must not harm or desecrate an object that the person knows is an Aboriginal object.
- s86(2) A person must not harm an Aboriginal object.
- s86(3) A person must not harm or desecrate an Aboriginal place.

Penalties for harming Aboriginal objects or places range from $80,000–$800,000 for individuals and $330,000–$1,650,000 for corporations, and may also include imprisonment. Under Section 87, there are certain defences from prosecution. These include that harm was authorised under an Aboriginal Heritage Impact Permit (AHIP) and actions were in accordance with the AHIP; that due diligence was exercised in relation to Aboriginal object/s; and/or that the activity was classified as low impact.

Under Section 89A, an Aboriginal object must be reported to Heritage NSW within a reasonable timeframe unless they have previously been recorded and submitted to the Aboriginal Heritage Information Management System (AHIMS). Penalties for failure to report an Aboriginal object start from $16,500 for individuals and $33,000 for corporations.

2.2 National Parks and Wildlife Regulations 2019

This Regulation provides a framework for exercising due diligence and outlines codes of practice in respect to Aboriginal objects (Section 57), as well as defences for carrying out certain low-impact activities (Section 58). The Regulation also outlines requirements for Aboriginal consultation (Section 60), particularly in relation to an Aboriginal Heritage Impact Permit. Under the Regulation, the following codes of practice are recognised, amongst others:

- *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (DECCW 2010c),
- *NSW Minerals Industry Due Diligence Code of Practice for the Protection of Aboriginal Objects* (NSW Minerals Council 2010)*, and*
- *Code of Practice for Archaeological Investigation of Aboriginal objects in NSW* (DECCW 2010b).
- *Code of Practice for Archaeological Investigation of Aboriginal objects in NSW* (DECCW 2010b).

2.3 Aboriginal Land Rights Act 1983

This Act provides land rights to Aboriginal people through the Local Aboriginal Land Councils. It details a process for claiming unused Crown Land in NSW and for enabling land use. It also allows for agreements to permit traditional hunting, fishing and gathering.

2.4 Environmental Planning and Assessment Act 1979

The Environmental Planning and Assessment (EP&A) Act provides triggers for undertaking environmental and heritage assessments as part of the wider land-use planning framework. This Act has three main parts of direct relevance to Aboriginal cultural heritage. Namely, Part 3 which governs the preparation of planning instruments, Part 4 which relates to development assessment provisions for local government (consent) authorities and Part 5 which relates to activity approvals by governing (determining) authorities. Planning decisions within Local Government Areas (LGAs) are guided by Local Environmental Plans (LEPs). Each LGA is required to develop and maintain an LEP that includes Aboriginal and historical heritage items which are protected under the EP&A Act and the NPW Act.

The Project Area is located within the Lake Macquarie LGA and falls under the 2014 LEP.

2.5 Lake Macquarie Local Environmental Plan 2014

The Lake Macquarie LEP 2014 requires development consent to demolish, disturb, excavate or develop land on which an Aboriginal object is located or that is within an Aboriginal place of significance. Hunter Water must consider the effect of a proposal on an Aboriginal Place and any Aboriginal object located within an area of works. Hunter Water must inform the local Aboriginal community about the application where impacts to Aboriginal cultural heritage may occur. Protected heritage under the LEP is listed in Schedule 5.

There are no Aboriginal sites in the Project Area listed on the LEP.

3 Aboriginal Consultation

This section documents the Aboriginal Consultation that was undertaken for the project in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (OEH, formerly DECCW 2010b) and will be referred to as the 'Aboriginal Consultation Requirements'. The four stages of Aboriginal consultation were undertaken and additional documentation is available in Appendix 1.

3.1 Stage 1

In accordance with Stage 1 of the Aboriginal Consultation Requirements requests for information on knowledge holders were sent to the Heritage NSW Office, the Awabakal LALC, the Registrar of Aboriginal Owners, Native Title Services, National Native Title Tribunal, the Newcastle City Council, the Lake Macquarie City Council, and the Hunter office of Local Land Services on 30/9/2020. The National Native Title Tribunal only accepts searches of crown land for Aboriginal knowledge holders. There is no crown land in the Project Area.

Based on information collected from government agencies, expressions of interest were sent to the knowledge holders inviting them to become a Registered Aboriginal Party for the project.

A public notice was placed in the Newcastle Herald local newspaper on October 6, 2020.

As a result of the expressions of interest invitations and the public notice, 11 Aboriginal representatives nominated to become RAPs for the Project (Table 3).

Table 3. List of RAPs consulted for the Project.

Organisation/Individual	**Representative Name/s**
A1 Indigenous Services	Carolyn Hickey
Awabakal & Guringai Pty Ltd	Tracey Howie
Awabakal Descendants Traditional Owners Aboriginal Corporation	Peter Leven
Awabakal LALC	Peter Townsend
Awabakal Traditional Owners Aboriginal Corporation	Kerrie Brauer
Didge Ngunawal Clan	Paul Boyd & Lilly Carroll
Jumbunna Traffic Management Group Pty Ltd	Norm Archibald
Kawul Pty Ltd trading as Wonn1 Sites	Arthur Fletcher
Lower Hunter Aboriginal Incorporated	David Ahoy
Widescope Indigenous Group	Steven Hickey
Yarrawalk (A division of Tocomwall Pty Ltd), Tocomwall Pty Ltd on behalf of Scott Franks and Anor on behalf of the Plains Clans of the Wonnarua People NSD1680/2013	Scott Franks

3.2 Stages 2 and 3

In accordance with Stages 2 and 3 of the consultation process, details of the project and the assessment methodology was sent out to the RAPs (27/10/2020) with a 28-day period for review and opportunities for feedback were provided before the fieldwork. Opportunities for feedback were also provided during the fieldwork. A summary of feedback received is provided in Table 4. Opportunities for feedback were also provided during the fieldwork.

Table 4. Responses to assessment methodology and project information from RAPs.

Organisation/Individual	Representative Name/s	Response summary (full response in Appendix 1)	Date
A1 Indigenous Services	Carolyn Hickey	Supports the information and methodology	10/01/2022
Awabakal Traditional Owners Aboriginal Corporation	Kerrie Brauer	Agrees with the methodology	31/01/2022

3.3 Stage 4

The draft report will be sent to the RAPs and 28 days provided for comment as per the statutory timeframe.

3.4 Summary

As a result of the Aboriginal consultation process 11 RAPs were identified. Feedback from the Aboriginal consultation, thus far, has been incorporated into the assessment of significance and the development of heritage management and mitigation strategies for the Project

4 Environmental and Heritage Context

This section compiles, analyses and synthesises relevant contextual information for the Project Area and provides an understanding of the cultural landscape.

4.1 Environmental Context

This section provides the environmental context for the assessment of past Aboriginal occupation in the Project Area.

This section considers the environment as it was during the Holocene, as Pleistocene sites are not expected.

4.1.1 Geology and Soils

The underlying geology can provide information on stone resources available to Aboriginal people. Soil characteristics provide information on potential archaeological deposits.

The Project Area is located within the Boolaroo subgroup of the Newcastle Coal measures, consisting of sandstone, conglomerate, siltstone, coal and tuff (Hawley, Glen, and Baker 1995). Common stone artefact materials known to be used by Aboriginal people of the Hunter Valley in the past include silcrete, indurated mudstone/ tuff (IMT), fine grained silicious (FGS), chert and quartz. Of these, IMT is the most likely to be present in the Project Area. Furthermore, quality sandstone in this region could provide natural sandstone exposures suitable for grinding axes and other stone artefacts.

The Project Area is located across three classes of soil landscapes: Killingworth, Cedar Hill and Disturbed Terrain (Matthei 1995) (Figure 4). Killingworth is a soil landscape generally occurring between elevations of 50-160m on rolling hills and low hills in the Awaba Hills region. Soils are shallow to moderately deep (<60cm - <150cm) on crests and hillslopes. The general soil profile of this landscape can change quickly and depends on the thickness of the underlying sandstone/tuff/mudstone interbeds. The general soil profile of this landscape on crests of tuff is 0-10 cm of brownish black pedal loam (A_1 horizon), overlying 10-20 cm bleached hard setting loamy sand to sandy clay loam (A_2 horizon). Occasionally, 17-55 cm of the A_1 horizon soils may directly overlie bedrock. Erosion is likely to occur in areas which have been cleared of vegetation and are poorly maintained. Often the topsoil (A_1 horizon) has been completely lost to erosion, leaving the A^2 horizon exposed (Matthei 1995, 143). Therefore, it is unlikely there could be deep subsurface deposits in the Project Area in this soil landscape, as it is known to have been impacted by land-use activities, such as vegetation clearance and vehicle movement, in the past (Section 4.1.4).

The Cedar Hill soil landscape is characterised by rolling to steep rises on Permian siltstones and sandstones in the Awaba Hills and Sugarloaf Ranges. It often occurs on slopes facing south or southeast. The underlying geology of this soil landscape is the Tomago Coal Measures, consisting of shale, mudstone, sandstone, tuff, coal and clay, and the Newcastle Coal Measures, consisting of irregular coal seams, tuff, sandstone and shale. The A_1 Horizon is a friable black silty clay loam (12-48 cm) on well drained upper slopes, overlying 120 – 200 cm pedal brown silty clay in the B Horizon. A brown hard setting sandy clay loam occurs occasionally as a topsoil (A_2 Horizon). This soil landscape is prone to sheet and gully erosion on steep, cleared upper slopes (Matthei 1995, 83). Therefore, it is

unlikely there could be deep subsurface deposits in the Project Area in this soil landscape, as it is known to have been impacted by land-use activities in the past (Section 4.1.4)

Disturbed Terrain includes level plain to hummocky terrain that has been disturbed by human activity. Landfill includes soil, rock, building and waste materials, with original vegetation completely cleared. In these areas most of the original site has either been removed, buried or greatly disturbed (Matthei 1995, 235). It is therefore very unlikely that there would be any subsurface deposits in the Project Area within this soil landscape.

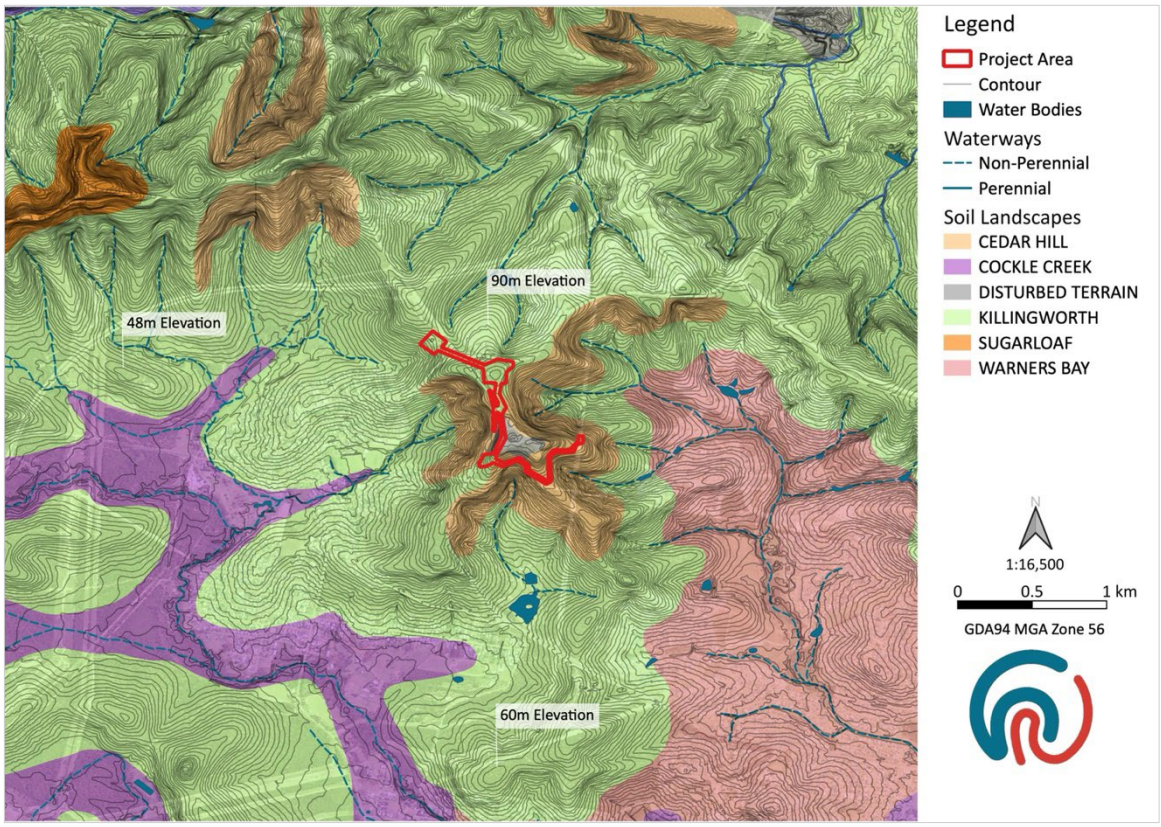


Figure 4. Soil landscape of the Project Area and surrounding region. (Source: Matthei 1995 soil landscapes, DTDB topography and SIX Maps aerial with Heritage Now additions)

4.1.2 Topography, Hydrology and Landforms

The topography, hydrology and landforms provide information on the likelihood and nature of past Aboriginal occupation in the Project Area. Situated in the Awaba Hills region, a landscape of undulating hills between the Sugarloaf Ranges to the west, Lake Macquarie to the south, Newcastle and the Hunter River to the east and the Hunter Wetlands to the northeast, the Project Area consists of a ridgeline which has a high point of approximately 112m AHD and elevation, as well as slopes falling away from this ridgeline. The peak of the crest is known as Cocked Hat Hill and is located approximately 450 m southeast of the Project Area. The ridgeline may have been used as a pathway to resources and camp sites, which was a common practice of Aboriginal people in the past (Daniel 2018).

Access to freshwater is known as a primary consideration for Aboriginal people when they went to establish amps. Studies from the Hunter Valley (Kuskie and Kamminga 2000; Kuskie 2015) demonstrate that areas within 300 m of wetlands and freshwater are considered to have been

camping and focused occupation (i.e., repeated visits, visits of longer duration). Conversely, areas further than 300 m from wetlands and/or water sources were outside the primary or secondary resource zones, and are likely to have had low to very low intensity use for hunting and/or gathering during the course of the normal daily round, or for transitory movement.

The Project Area is located 150 -300m away from a number of first order, nonperennial streamlines. Most of these streamlines are first-order tributaries of Slatey Creek and Cocked Hat Creek. These streams which drain in all directions from the crest and slopes of Cocked Hat Hill towards Lake Macquarie and the Hunter Wetlands. The area is unlikely to have been preferred as a habitation location given the ephemeral nature of the unnamed streamline. Habitation would be more likely near permanent water sources in perennial rivers or waterbodies.

4.1.3 Flora and Fauna

This section is intended to give a general overview of the flora and fauna that may have been used by Aboriginal people in the past. The information has been supplied for understanding the past Aboriginal use of the landscape and is not intended for ecological assessment purposes.

It is probable that the Project Area would have hosted Sydney Coastal Dry Sclerophyll Forests based on the NSW vegetation classifications (Keith 2004). This vegetation class contains open eucalypt forests and woodlands 10-25 m tall with a prominent and diverse sclerophyll shrub understorey and ground cover of sclerophyll sedges. Many of the plant species of the forest would have been used by Aboriginal people. For example, old man and hairpin banksia, broad leaved geebung and grass trees are known to have been used by Aboriginal people, as well as attracting animals which could be hunted (Robinson 1991, 100). Some of these species are likely to have been utilised as raw materials for implements and weaving, as well as food and medicine. The forest provided the habitat for wallabies, kangaroos, potoroos, possums, bats, and quoll species. These faunae could have provided a source of food and their hides could have been used as a resource to make clothing. The plentiful flora and fauna that is likely to have existed within the Project Area and surrounds would have made it a favourable location for collecting resources during the Holocene.

4.1.4 Land Use

Land is disturbed if it has been the subject to modern human activity that has changed the land's surface. Examples include ploughing, construction of rural infrastructure, roads, trails and tracks, vegetation clearance, construction of buildings, structures, and utilities and other impacts involving earthworks (DECCW 2010, 18).

There is evidence that extensive coal mining has occurred in the area in the past, which is likely to have disturbed portions of the Project Area. Portions 98, 99 and 100 of the Teralba Parish were gazetted to George Henry and Mary Lane on 11/4/1888. These portions were then passed onto the West Wallsend Coal Co. the following year. The Parish map from 1897 shows the portion of land where the Project Area is situated in Portion 99 (Figure 4). The township of West Wallsend grew up around the mines in the area. Aerial imagery from 1966 (Figure 5) shows partial clearance of land in the Project Area and infrastructure, presumably related to water supply.

Clarke and Kuskie (2006, p.3) identified that recent land-use impacts are widespread in the locality, including vegetation removal, dumping of soil/sediments and refuse, and construction of vehicle tracks. This ground disturbance was prolific across the site, and the archaeologists assessed that

'recent human impacts have been widespread in accordance across the study area, and given the skeletal nature of the soils and topographic context, the potential for deposits of sufficient integrity to be of research value is assessed as low.'(Clarke and Kuskie 2006, 25)

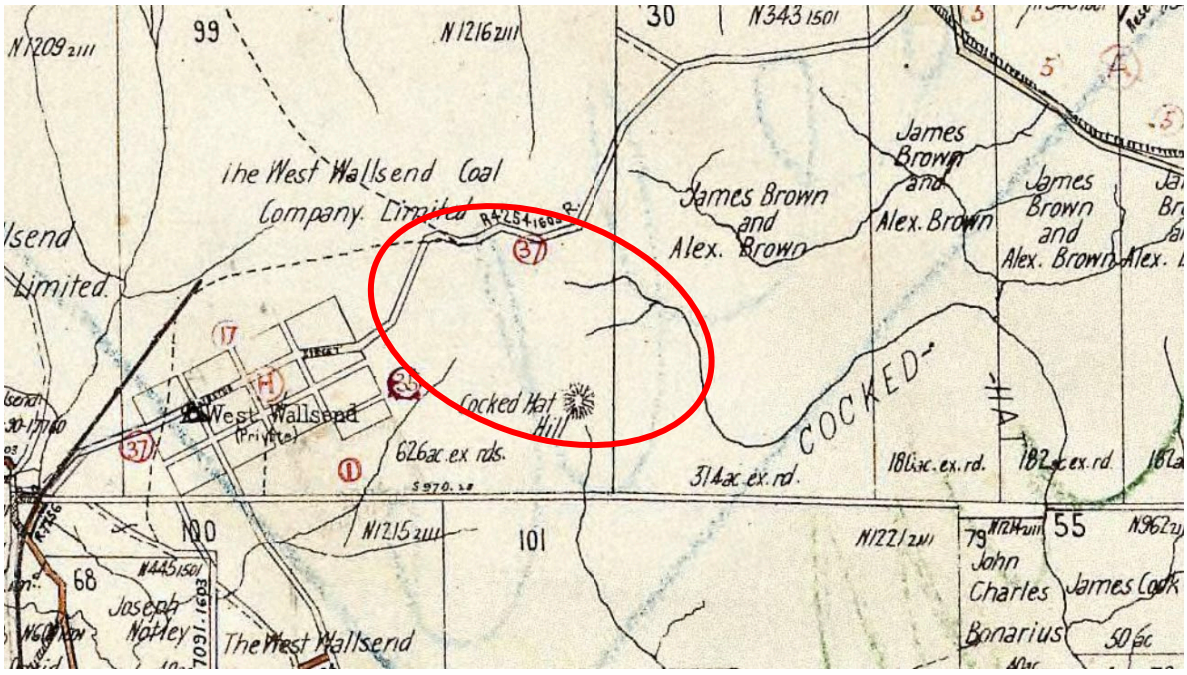


Figure 5. 1897 Teralba Parish Map with general vicinity of the Project Area circled. (Source: NSW Land Registry Services Historical Maps)

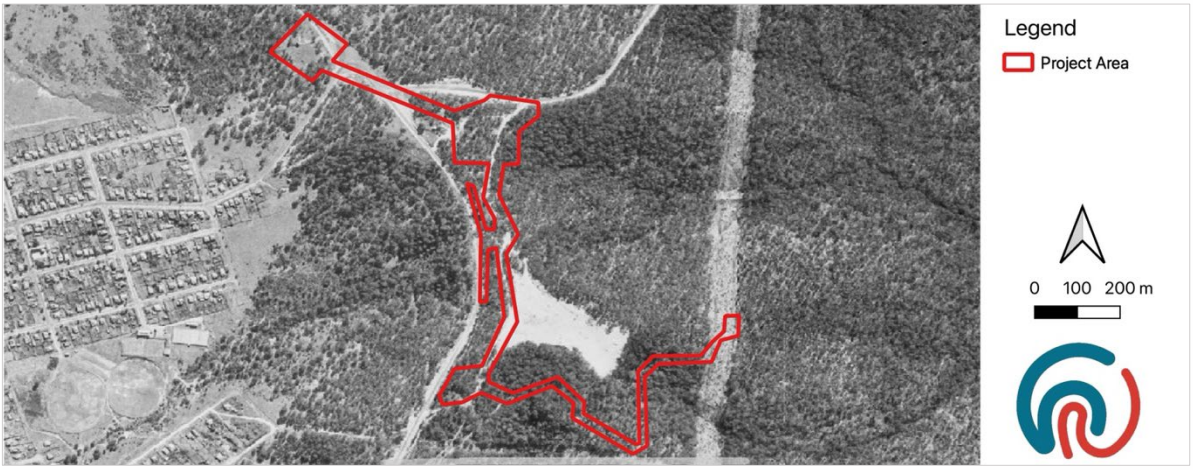


Figure 6. Aerial imagery of West Wallsend and surrounds 1966 (Source: Spatial Services NSW).

4.1.5 Synthesis

The landscape had features that may have supported Aboriginal people in the past. The relatively high elevations on the site were within rich forested land and nearby to important resource gathering and ceremonial sites. The ridgeline may have formed part of a travel route between these places. Due to the elevation of the site, there does not appear to be any large permanent fresh water sources within the Project Area suitable for drinking, although there are drainage channels and water courses in the slopes and low-lying areas in the surrounding landscape. Vegetation

clearance and the building of roads and infrastructure in and around the Project Area could affect the potential archaeological deposits within this soil landscape which has high erodibility.

4.2 Heritage Context

This section outlines the Aboriginal heritage context of the Project Area. Reviewing the archaeological, ethno-historical, and post-contact history of an area provides contextual information that informs Archaeological predictions for the Project Area.

4.2.1 Historic Records of Aboriginal Occupation

The Awabakal people are the recognised Traditional custodians of the Project Area (Tindale 1974). Early historical records indicate that the Awabakal were part of a nexus of tribes in the Newcastle and Hunter River District (Gunson 1974, 3). These tribes were interconnected, with clear distinctions between coastal groups and those further inland (Gunson 1974, 4) (Irish 2017).

The language and customs of the Awabakal people was shared by Aboriginal leader Biraban and recorded by Reverend Lancelot Threlkeld, who established the Bahtahbah mission on the Eastern side of Lake Macquarie near present day Belmont in 1825. His mission became a refuge for Awabakal people in periods of frontier violence, particularly prevalent in 1825 and 1826 (Dictionary of Sydney 2020). This mission operated until 1829, when he relocated the mission to present day Toronto. In 1836, Threlkeld mentions that a group of Aboriginal people listed as 'Cobbera's Tribe', or the Sugarloaf tribe, which frequented the Sugarloaf ranges, Lake Macquarie, and the surrounding swamp areas. Gunson (1974, 30) interpreted that this group may have been the 'tribe' called Pambalong, a clan of the Awabakal people.

Although Cocked Hat Hill is not known to be associated with historic records of Aboriginal occupation, Mt Sugarloaf (part of the Sugarloaf Ranges), around 5km west of the Project Area, is frequently recorded in the historic records, and is known to be highly significant to the Awabakal people in the past and today. Known as Warrawelong, it is significant for its views across Awabakal Country, its association with Dreaming stories, and as the location of significant sacred ceremonies. The Awabakal also have a creation story about Mount Sugarloaf, and it is a place where sacred ceremonies are known to have taken place (Lake Macquarie City Library n.d.).

4.2.2 Archaeological Background

While the Aboriginal occupation of Australia is currently accepted as beginning approximately 65,000 years ago (Clarkson et al. 2017), the Aboriginal occupation of the area known as the Hunter Valley in NSW has been dated to approximately 20,000 years (Brayshaw 1987, 100). Radiocarbon dates obtained from charcoal at a site in Glennies Creek, north of Singleton, found that artefacts within the deposit dated to approximately 20,200 years before present (BP). Despite this Pleistocene period site, most of the archaeology in the Hunter region has been dated to the Holocene period.

There are many types of evidence past Aboriginal occupation which form the archaeological record of a region. Places which show evidence of Aboriginal occupation of an area in the past are described as archaeological sites. These sites contain numerous site features, as defined in Table 5. Some archaeological sites contain more than one of these features.

Table 5. Aboriginal site features description, as per OEH 2012 unless otherwise referenced.

Site Features	OEH 2012 Description
Aboriginal Ceremony and	Previously referred to as mythological sites these are spiritual/story places where no physical evidence of previous use of the place may occur, e.g.,

Site Features	OEH 2012 Description
Dreaming	natural unmodified landscape features, ceremonial or spiritual areas, men's/women's sites, dreaming (creation) tracks, marriage places etc.
Aboriginal Resource and Gathering	Related to everyday activities such as food gathering, hunting, or collection and manufacture of materials and goods for use or trade.
Art	Art is found in shelters, overhangs and across rock formations. Techniques include painting, drawing, scratching, carving engraving, pitting, conjoining, abrading and the use of a range of binding agents and the use of natural pigments obtained from clays, charcoal and plants.
Artefact	Objects such as stone tools, and associated flaked material, spears, manuports, grindstones, discarded stone flakes, modified glass or shell demonstrating evidence of use of the area by Aboriginal people.
Burial	A traditional or contemporary (post-contact) burial of an Aboriginal person, which may occur outside designated cemeteries and may not be marked, e.g., in caves, marked by stone cairns, in sand areas, along creek banks etc.
Ceremonial Ring	Raised earth ring(s) associated with ceremony.
Conflict	Previously referred to as massacre sites where confrontations occurred between (1) Aboriginal and non-Aboriginal people, or (2) between different Aboriginal groups.
Earth Mound	A mounded deposit of round to oval shape containing baked clay lumps, ash, charcoal and, usually, black or dark grey sediment. The deposit may be compacted or loose and ashy. Mounds may contain various economic remains such as mussel shell and bone as well as stone artefacts. Occasionally they contain burials.
Fish Trap	A modified area on watercourses where fish were trapped for short-term storage and gathering.
Grinding Groove	A groove in a rock surface resulting from manufacture of stone tools such as ground edge hatchets and spears, may also include rounded depressions resulting from grinding of seeds and grains.
Habitation Structure	Structures constructed by Aboriginal people for short- or long-term shelter. More temporary structures are commonly preserved away from the NSW coastline, may include historic camps of contemporary significance. Smaller structures may make use of natural materials such as branches, logs and bark sheets or manufactured materials such as corrugated iron to form shelters. Archaeological remains of a former structure such as chimney/fireplace, raised earth building platform, excavated pits, rubble mounds etc.
Hearth	Cultural deposit sometimes marked by hearth stones, usually also contains charcoal and may also contain heat treated stone fragments.
Modified Tree	Trees which show the marks of modification as a result of cutting of bark from the trunk for use in the production of shields, canoes, boomerangs, burials shrouds, for medicinal purposes, foot holds etc, or alternately intentional carving of the heartwood of the tree to form a permanent marker to indicate ceremonial use/significance of a nearby area, again these carvings may also act as territorial or burial markers.
Non-Human Bone and Organic Material	Objects which can be found within cultural deposits as components of an Aboriginal site such as fish or mammal bones, ochres, cached objects which may otherwise have broken down such as resin, twine, dilly bags, nets etc.
Ochre Quarry	A source of ochre used for ceremonial occasions, burials, trade and artwork.

Site Features	OEH 2012 Description
Potential Archaeological Deposit (PAD)	An area where sub-surface stone artefacts and/or other cultural materials are likely to occur' (DECCW 2010, 38).
Shell	An accumulation or deposit of shellfish from beach, estuarine, lacustrine or riverine species resulting from Aboriginal gathering and consumption. Usually found in deposits previously referred to as shell middens. Must be found in association with other objects like stone tools, fish bones, charcoal, fireplaces/hearths, and burials. Will vary greatly in size and components.
Stone Arrangement	Human produced arrangements of stone usually associated with ceremonial activities, or used as markers for territorial limits or to mark/protect burials.
Stone Quarry	Usually, a source of good quality stone which is quarried and used for the production of stone tools.
Waterhole	A source of fresh water for Aboriginal groups which may have traditional ceremonial or dreaming significance and/or may also be used to the present day as a rich resource gathering area (e.g., waterbirds, eels, clays, reeds etc).

Most details of known Aboriginal archaeology in the region are contained in the Aboriginal Heritage Information Management System (AHIMS), which is discussed below.

4.2.3 Aboriginal Heritage Information Management System (AHIMS)

The AHIMS was searched on 3/9/2021 based on the Cameron Park Reservoir from -32.91, 151.58 (latitude/longitude) to -32.89, 151.61 (latitude/longitude) with a one-kilometre buffer. The search produced a result of 18 sites (Figure 6), summarised in Table 6. The most common sites were those that had stone artefacts (including isolated finds, PAD (Potential Archaeological Deposit) and artefacts, and artefact scatters), comprising 60% of the total sites. Stone artefacts often dominate the archaeological record because they preserve well compared to other materials such as bone implements, clothing, ornamentation, medicinal supplies, woven goods, and wooden weapons used by Aboriginal people.

There is a sacred Aboriginal women's site (restricted site) around 400m east from the Project Area. The exact location of this site is confidential, and information restricted in AHIMS.

There is one AHIMS site (38-4-0989) is located within the Project Area.The AHIMS site card describes this site as an artefact scatter comprising two loci of evidence in the gentle ridge crest south of Cameron Park Drive and east of George Booth Drive. Locus A comprises four artefacts (all red silcrete including flakes, flake portions and a nondescript core) and is in a 40 x 12 m. The artefacts are located on substantial gravel exposures associated with a vehicle track. Locus B comprises three artefacts (including a pink silcrete flake, a brown tuff medial flake portion and brown rhyolite nondescript core fragment) and is in a 10 x 2 m area. The artefacts are located on an existing vehicle track running south from Cameron Park Drive.

Table 6. AHIMS site types. All stone artefact categories are highlighted blue.

Site Types	Count	Per cent
Artefact/s	10	55.56%
Artefact Scatter	2	11.11%
Restricted	2	11.11%
Modified Tree	1	5.56%
Stone Arrangement	1	5.56%
Grinding Groove	1	5.56%
Isolated Find	1	5.56%
Total	**18**	**100%**

Figure 7. AHIMS search results. (Source: SIX Maps aerial with Heritage Now and AHIMS additions)

4.2.4 Previous AHIP in Project Area

A previous s90 Application was approved for this site in February 2008 (AHIP 2820). The AHIP was issued to cover the collection of Aboriginal objects from site AHIMS 38-4-0989, and to undertake monitoring of the initial land clearance across the proposed development and collect any Aboriginal objects located through this process. Responsibility for the safe and secure care of Aboriginal objects from AHIMS 38-4-0989 was with the executive of the Awabakal LALC under Care Agreement AHIMS 2821. This AHIP remained in force for 2 years from the date of commencement, and therefore this approval has since lapsed and a new approval is required in order to facilitate the construction of the new reservoir.

4.2.5 Heritage Report Summaries

Heritage reports relevant to the Project Area have been summarised in this section to provide an understanding of the previous assessments that have been undertaken and their implications for Aboriginal site patterning, as well as a review of the extensive survey work undertaken within and around the Project Area. The locations of the studies discussed and their proximity to the Project Area are illustrated in Figure 8.

Resource Planning 1991 Archaeological Survey of George Booth Drive Upgrading

Note: this report was not located on AHIMS or available online, and thus secondary information was used for the summary.

Resource Planning (1991) Archaeological Survey of George Booth Drive Upgrading undertook an archaeological assessment along a section of George Booth Drive between the Northville Drive Roundabout and Cameron Park Drive. One artefact scatter (consisting of a flaked piece and a core) and an isolated find (a flaked piece) were identified, and the area was assessed as being heavily disturbed (Umwelt 2009, 4.4)

Resource Planning (1993) Archaeological Survey, Northlakes Urban Release Area, Edgeworth/Wallsend, NSW

This report presents the results of a survey of 650 ha of land for the proposed Northlakes Urban Release residential development. The study area is bounded by Minmi Road, George Booth Drive, Cameron Park Drive and the northern and western limits of Edgeworth. A portion of the current Project Area on the eastern side of George Booth Drive and around Cocked Hat Hill is located within this study area. At the time of survey, the area was densely vegetated with low surface visibility. No archaeological sites were found within the survey area, although a previously recorded site (AHIMS 38-4-0115) was relocated. The previous recording noted fourteen grooves on a sandstone outcrop in a tributary of Cocked Hat Creek. Seven previously recorded grooves were observed during survey, as well as one previously unrecorded groove. The other seven were obscured by water. Another two grooves were observed 3 m downstream, and another fourteen grooves 1 m downstream from there, making 31 grooves in total (Resource Planning 1993, 11). This survey showed the site to be more extensive and of greater archaeological and cultural significance than previously thought (Resource Planning 1993, 12–13). The flat bank adjacent to the site is considered to have high archaeological potential to reveal evidence of campsite activities associated with the axe grinding groove site (Resource Planning 1993, 14). It was advised that impacts to the site should be avoided, including the realignment of a proposed cycle/pedestrian way. In addition, it was recommended that the site be incorporated into a strategy plan and used as an educational resource.

No other sites were observed during survey. This is potentially a result of poor ground surface visibility outside of the creek lines and tracks.

Mills Archaeological Services (1999) Aboriginal Heritage Study, Cameron Park

An archaeological survey of 324 ha of land at Edgeworth bound by Minmi Road, Cameron Park Drive and Wallsend Road, was undertaken for a proposed residential development, now known as the Northlakes Estate. This includes a portion of the current Project Area, particularly the eastern side of George Booth Drive and around Cocked Hat Hill. One previously recorded site was relocated (AHMIS 38-4-0115). Three new artefact scatters, seven isolated finds and six areas of PAD were recorded during survey of the site. Artefacts included flakes, debitage, and one scraper. Silcrete was the most

common material observed, with chert and mudstone also present (Mills 1999, Appendix 2). Site NL-IF3 (AHIMS 38-5-0180) was identified during this survey; an isolated cream chert/mudstone flake. It was located approximately 500 m west of the grinding groove site, AHIMS 38-4-0115, and is recorded as approximately 10 m from the current Project Area. The area surrounding the artefact was assessed as disturbed by the raising of an adjacent track and power poles. No areas of PAD were associated with the low-lying landscape surrounding the isolated find (Mills 1999, 15). All newly identified sites were assessed as having low archaeological significance, however the totality of sites within the Cocked Hat Creek corridor was assessed as having potentially high archaeological significance.

Clarke & Kuskie (2006), Aboriginal Heritage Impact Assessment, Cameron Park

This report was commissioned by the Department of Commerce on behalf of Hunter Water Corporation to undertake an Aboriginal heritage impact assessment of the proposed water reservoir site near West Wallsend. The study area of this report is a small 1-hectare area on the south side of Cameron Park Drive and the east side of George Booth Drive. It is located within the footprint of the current Project Area. One artefact scatter was identified during the survey, consisting of two loci of evidence on a gentle ridge crest south of Cameron Park Drive. The scientific significance of this site was assessed as low within both local and regional contexts, while the Aboriginal stakeholders expressed interest in the contemporary significance to Aboriginal people as a tangible link to their past. This report describes the possibility of artefact deposits that are of sufficient integrity and research potential to be low, and notes that much of the study area has been impacted by recent land-use practices and the “soils are skeletal in nature” (Clarke and Kuskie 2006).

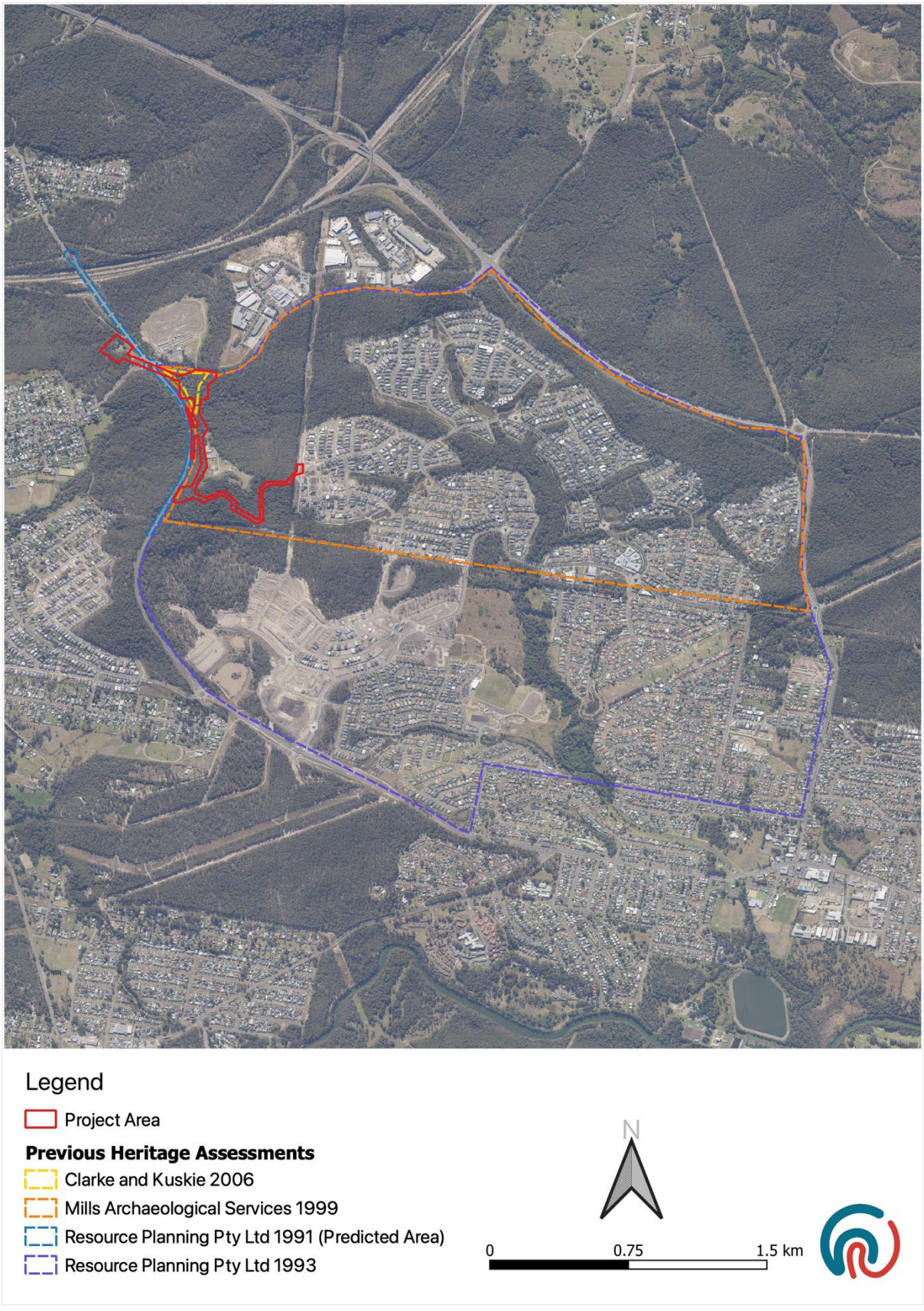


Figure 8. Nearby archaeological investigations discussed in Section 4. (Source: SIX Maps aerial with Heritage Now additions).

4.2.6 Artefact Density Predictive Modelling

Predictive models are based on upon the assumption that environmental factors provide distinctive sets of constraints that influence land-use patterns (Kuskie 2015, p. 8). In the Hunter Valley, for instance, J.W. Fawcett in 1898 said of the Wonnarua, that when choosing the sites for their camps, access to fresh water was one essential and a food resource of secondary importance, whilst a vantage point in case of attack by an enemy was third (Brayshaw 1987, 42).

Artefact density is linked to different types of activities falling on a scale from long-term occupation to short-term transitory movement. Attenbrow (2006) built on earlier archaeological models to develop a model of occupation within the Australian context, identifying base camps, activity camps and transit camps. Base camps are similar to residential bases in that they were occupied for a longer period of time (several days or longer). Activity camps, conversely, are characterised by short periods of use, and are usually functionally specific. Activities that may take place at activity camps in Australia include hunting, artefact preparation, gathering of raw materials, and ceremonial activities (Attenbrow 2006, 220–21). 'Transit camp' refers to places that were used to camp for short periods, usually overnight, often when travelling between base camps or resource areas. Archaeologically, base camps are characterised by a larger archaeological context (in square metres), higher concentrations of stone artefacts, and a more diverse assemblage than transit and activity locations. Stone artefacts in these assemblages may show signs of tool manufacture and maintenance, skin working and food preparation (Attenbrow 2006, 221).

A clear trend has been identified in the Hunter Region in which higher artefact densities occur closer to wetlands, indicating that wetlands were a major focus of activity in the area (Kuskie 1994) Specifically, areas within 300 m of wetlands and freshwater are considered to have been camping and focused occupation (i.e. repeated visits, visits of longer duration), whereas areas further than 300 m from wetlands and/or water sources were outside the primary or secondary resource zones, and are likely to have only had low to very low intensity use for hunting/gathering during the course of the normal daily round, or for transitory movement (Kuskie 2015).

4.3 Summary of local and regional character of Aboriginal land use and its material traces

Early colonial records indicate that the Project Area was within Awabakal Country. The earliest known evidence Aboriginal occupation of the Hunter Valley Area has been dated to approximately 20,000 years (Brayshaw 1987, 100). Stone artefacts are expected to dominate the archaeological record because they preserve well in comparison to other materials such as bone implements, clothing, ornamentation, medicinal supplies, woven goods, and wooden weapons used by Aboriginal people.

There is ethnohistorical and archaeological information that suggests the duration/intensity that Aboriginal people would have occupied a certain area in the landscape was based on access to freshwater (including wetlands) and resource zones. Artefact density and characteristics can often help understand the type of occupation, and the various activities that were taking place, in an area. A key issue for the preservation of Aboriginal archaeology in the Hunter Valley is disturbance from land-use; over 200 years of convict, and then free-settler, colonial invasion in the Hunter region has disturbed or destroyed countless Aboriginal sites in the region.

4.4 Archaeological Predictions for the Project Area

Based on the background research, it was predicted that, pending on site conditions and preservation rates, the Project Area may contain a low to high density of stone artefact assemblages. Common stone material types will likely be silcrete and IMT (Indurated mudstone/tuff). The higher elevations, disturbed soils, and distance from permanent freshwater sources of the ridge crest of Cocked Hat Hill indicate that the Project Area is more likely to have been a locale of transitory activity. These predictions are primarily based on Clarke and Kuskie's (2006) assessment that the Project Area was used for transitory movement across the landscape, such as at Mt Sugarloaf, as opposed to long-term occupation. Geological information also indicates it is possible that IMT stone quarries and grinding grooves to occur to occur in the Project Area. It is considered very unlikely that any other archaeological site types (e.g., burials, wooden implements, modified trees, middens, ceremonial rings, habitation structures or earth mounds) would occur in the Project Area.

Table 7 describes the assessed likelihood of Aboriginal archaeological site features being present in the Project Area, on a scale of very low – very high likelihood.

Table 7 Likelihood of different sites features being preserved within the Project Area.

Site Features	Likelihood	Comment / Justification
Aboriginal Ceremony and Dreaming	Low	Nearby ceremonial site recorded, however none known to occur in the Project Area despite previous heritage assessments being undertaken in the locality previous.
Aboriginal Resource and Gathering	Low	No Aboriginal resource and gathering areas have been recorded in the area.
Art	Low	Aerial analysis and geological information do not indicate there will be rock shelters or formations on-site, which is where art sites are situated.
Artefact	Medium	This is the most common site type in the region. However, the potential for this artefact to occur in the Project Area is medium rather than high or very high due to the high degree of land-use disturbance which has occurred in the area.
Burial	Very Low	Land-use disturbance indicates that burials are very unlikely to be preserved in the Project Area.
Ceremonial Ring	Very Low	Land-use disturbance indicates that ceremonial rings are very unlikely to be preserved in the Project Area.
Conflict	Low	Many archaeological assessments have been undertaken in the region and none have identified the Project Area as being associated with conflict.
Earth Mound	Very Low	Land-use disturbance indicates that earth mounds are very unlikely to be preserved in the Project Area.
Fish Trap	Low	No fish-traps have been recorded in tributaries in the area.
Grinding Groove	Low	Although grinding grooves are present in the regional area, they are not present in large numbers, and the aerial analysis and geological information indicate that suitable outcrops are unlikely to be present in the Project Area.

Site Features	Likelihood	Comment / Justification
Habitation Structure	Very Low	Land-use disturbance indicates that habitation structures very unlikely to be preserved in the Project Area.
Hearth	Low	Land-use disturbance indicates that hearths are unlikely to be preserved in the Project Area.
Modified Tree	Low	Historic vegetation clearance indicates that old growth trees which have cultural markings and scars are unlikely to remain in the Project Area.
Non-Human Bone and Organic Material	Very Low	Land-use disturbance and environmental conditions indicate that Non-Human Bone and Organic Material is very unlikely to remain in the Project Area.
Ochre Quarry	Low	No ochre quarries have been recorded in the area.
Potential Archaeological Deposit (PAD)	Low – Medium	Reports by Kuskie suggest the soils are generally eroded in some part of the present Project Area. However, here could potentially be some intact deposits onsite where there has been limited land-use disturbance, such as around vegetated creek lines near Wallsend.
Shell	Low	No archaeological shell has been recorded in the area.
Stone Arrangement	Very Low	Land-use disturbance indicates that stone arrangements are very unlikely to be preserved in the Project Area.
Stone Quarry	Low	No stone quarries have been recorded in the area.
Waterhole	Low	Aerial analysis and geological information do not indicate there will be waterholes in the area.

5 Archaeological Survey

The Project Area was surveyed on 14 February 2022 by Lara Tooby of Heritage Now and Pete Townsend of Awabakal LALC. The aim of the survey was to identify Aboriginal sites within the Project Area as per the guidelines (DECCW 2010b, 12). This included a re-inspection of AHIMS Site 38-4-0989.

5.1 Survey Units and Methods

Following Speight's (2009) landform classification, the Project Area was surveyed in three survey units (SU) defined by broad landform categories: Slope (SU1 - north and SU3- south) and Ridge (SU2) As seen in Figure 9, the survey area was slightly different to the final Project Area; nevertheless, all landforms were sampled. The area was traversed by foot, generally with a 2-10 m spacing between the survey personnel. Areas of high visibility and exposure were subject to detailed inspection. A summary of visibility and exposure is detailed in Table 8.

Table 8. Survey coverage.

Survey Unit	Landform	Survey Unit Area	Visibility %	Exposure %	Effective Coverage Area (m2)	Sample Fraction (%)
1	Slope (north)	14392	20	10	287.84	2
2	Ridge	44419	30	20	2665.14	6
3	Slope (south)	30374	40	20	2429.92	8

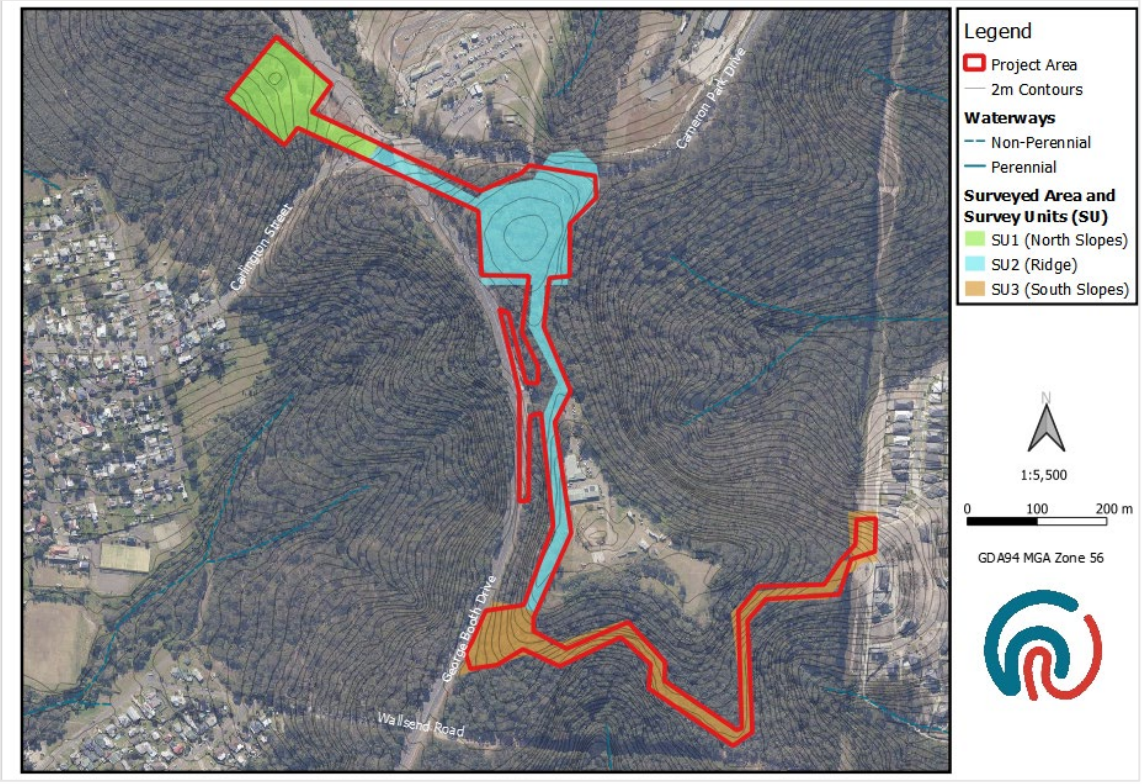


Figure 9. Illustration of Survey Units. (Source: SIX Maps aerial with DTDB topography and Heritage Now and additions).

5.2 Survey Results

SU1 (Survey Unit 1)

SU1 consisted of a simple slope around the locally listed (for non-Aboriginal heritage values) *West Wallsend Valve House and Underground Reservoir (I207)* (Plate 1), surrounded by stringybarks with a grassy understorey. The landscape around this item was heavily modified, and no sites were visible.

No sites and potential archaeological deposits were identified in SU1.

SU2 (Survey Unit 2)

SU2 consists of similar vegetation community to SU1, except it is along a ridgeline, and heavily modified by gravel fire trails, and heavily disturbed by logging and grading. The area where AHIMS Site 38-4-0989 was originally recorded was carefully inspected. The gravel track where artefact site AHIMS Site 38-4-0989 was recorded was reinspected (Plate 2) but none of the seven artefacts were re-identified Lara and Pete discussed possible reasons the artefacts were no longer visible; splash and sheet erosion have likely moved the artefacts, or since recording they have been covered by additional leaf litter and vegetation. No potential archaeological deposits were identified, due to skeletal and disturbed soils. No additional artefacts were recorded despite relatively good visibility and exposure.

No additional sites and potential archaeological deposits were identified in SU2.

SU3 (Survey Unit 3)

SU3 consisted of a side slope around a ridgeline, and mostly adhering to a gravel fire trails that were also in SU2 (Plate 3). Although there was relatively good exposure, no artefacts were located in this SU, which was considered to be heavily disturbed and modified through the creation of the trail.

No sites and PADs were identified in SU3.

5.2.1 Aboriginal Sites Identified

AHIMS Site 38-4-0989was ground-truthed, but none of the seven artefacts were identified during the survey. This is most likely due to splash and sheet erosion having moved the artefacts, or it is possible that since recording they have been covered by additional leaf litter and vegetation. No additional sites or PADs were identified in the Project Area.

5.2.2 Aboriginal Consultation

Pete Townsend of Awabakal LALC communicated that there are many significant ceremonial sites in the area, as well as travelling routes. The location of these routes and places is sensitive information, but Pete was able to confirm that the proposed works would not impact the values of these travelling routes and sites.

5.2.3 Summary

The seven artefacts comprising of AHIMS Site 38-4-0989, were ground-truthed, but none were identified during survey. This is most likely due to splash and sheet erosion having moved the artefacts, or it is possible that since recording they have been covered by additional leaf litter and vegetation. No additional sites or PADs were identified in the Project Area

6 Significance Assessment and Aboriginal Cultural Values

Cultural heritage refers to the tangible and intangible values that we choose to pass on to future generations. In order to identify the values worth passing on, a significance assessment needs to be undertaken. The significance assessment needs to: identify the range of values present across the Project Area and assess their importance.

6.1 Methodology

Identifying the Aboriginal cultural values is part of the significance assessment process and is guided by the Burra Charter and the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW.*

There are four recognised classes of values under the Burra Charter (Australia ICOMOS 2013):

- Social,
- Historical,
- Aesthetic, and
- Scientific

Within this significance assessment, Aboriginal cultural values are captured within social, historical and aesthetic values. The archaeological values are contained within scientific values.

Social value refers to the spiritual, traditional, historical or contemporary associations that Aboriginal people have for place. Historical value refers to the associations of a place with a historically important person, event, phase or activity in the Aboriginal community. Aesthetic value refers to the sensory, scenic, architectural and creative aspects of the place.

Archaeological values refer to the importance of the landscape, area, place or object because of its rarity, representativeness and the extent to which it may inform our understanding of Aboriginal culture.

6.1.1 Aboriginal Cultural Values

Aboriginal cultural values are identified through the Aboriginal consultation process. Formal opportunities for the Aboriginal community to contribute to identifying cultural values are provided in the ACHA methodology review period, during fieldwork and during the draft report review period. In addition, RAPs are invited to provide feedback at any time through the consultation process, by phone or in writing (email or letter).

6.1.2 Archaeological (Scientific) Values

Archaeological (scientific) values relate to whether the Project Area can contribute to our understanding of Aboriginal culture. Under the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW*, archaeological values are to be considered within the below sub-categories:

- Representativeness,
- Rarity,
- Research potential, and
- Educational potential.

Significance is expressed as grades: low, moderate or high.

6.2 Aboriginal Cultural Values of the Project Area

The Project Area holds Aboriginal cultural value in that it demonstrates Aboriginal occupation of the Cameron Park Area through registered site AHIMS Site 38-4-0989. The survey was unable to re-identify these artefacts, but they are likely still present in the Project Area. As such, a buffer zone around the artefact site, shown in Figure 10, is appropriate to demonstrate the location of Aboriginal cultural values in the Project Area.

Further comments on the cultural values of the Project Area will be sought when this report is sent out to RAPs for review and comment.

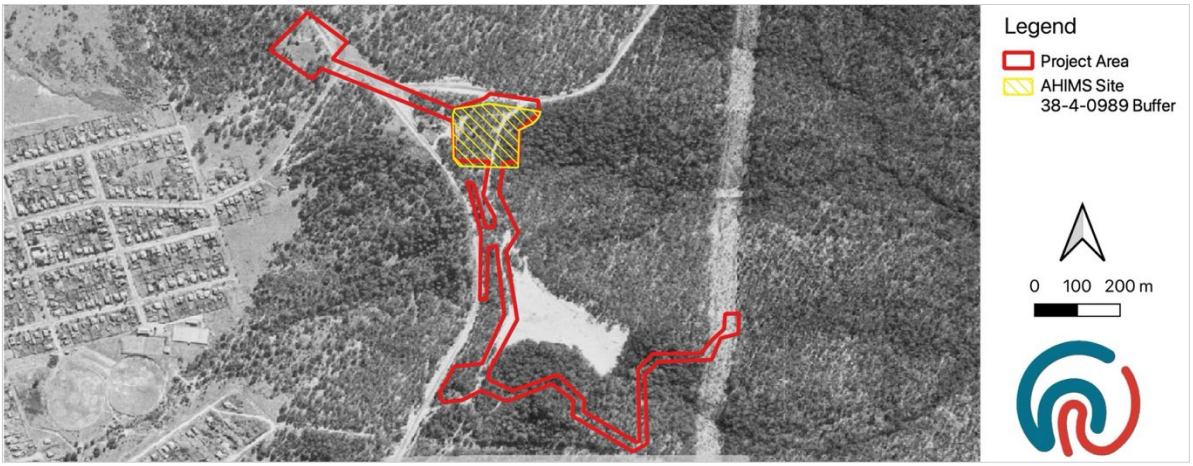


Figure 10. Illustration Aboriginal cultural values identified in this assessment. (Source: SIX Maps Aerial and Heritage Now additions).

6.3 Archaeological Values of the Project Area

AHIMS site 38-4-0989 was described as having the following values:

Site 'Cameron Park' is assessed as being of low scientific significance within both local and regional contexts. The identified loci of evidence comprise of only seven artefacts, none of which represent rare or unusual types. Levels of ground disturbance are moderate at the identified site loci and considering the skeletal nature of the soil, the potential for sub-surface deposits, particularly deposits that may be in situ *and/or of research value, is low. (Clarke and Kuskie 2006, 33).*

The current ACHA has determined these archaeological values remain valid today. Overall, the site representative of Aboriginal sites on a local level; however, the site is not rare and is of low research and educational potential. Overall, the site has low significance on a local and regional scale.

6.4 Summary: Statement of Significance

The Project Area contains one AHIMS site that has cultural and archaeological values: AHIMS site 38-4-0989. It is representative of Aboriginal sites on a local level; however, the site is not rare and is of low research and educational potential. Overall, the site has low significance on a local and regional scale.

7 Impact Assessment and Mitigation

This section assesses the potential impact of the proposed works in relation to Aboriginal heritage values in the Project Area and provides options for mitigating loss of Aboriginal cultural values.

7.1 Proposal Summary

As detailed in Section 1.2, the proposal involves the construction of a new reservoir site and watermain. This work is considered necessary for supporting the growing local community with their water requirements.

7.2 Impact Assessment

The Proposal will impact one Aboriginal site: AHIMS 38-4-0989. The consequence of this harm will be partial loss of value, as the artefacts will be conserved ex-situ and will be removed to a safe location in consultation with the RAPs (Table 9).

Table 9. Summary of impact assessment.

Site	Type of Harm	Degree of Harm	Consequence of Harm
AHIMS 38-4-0989	Community Collection	Total	Partial loss of value

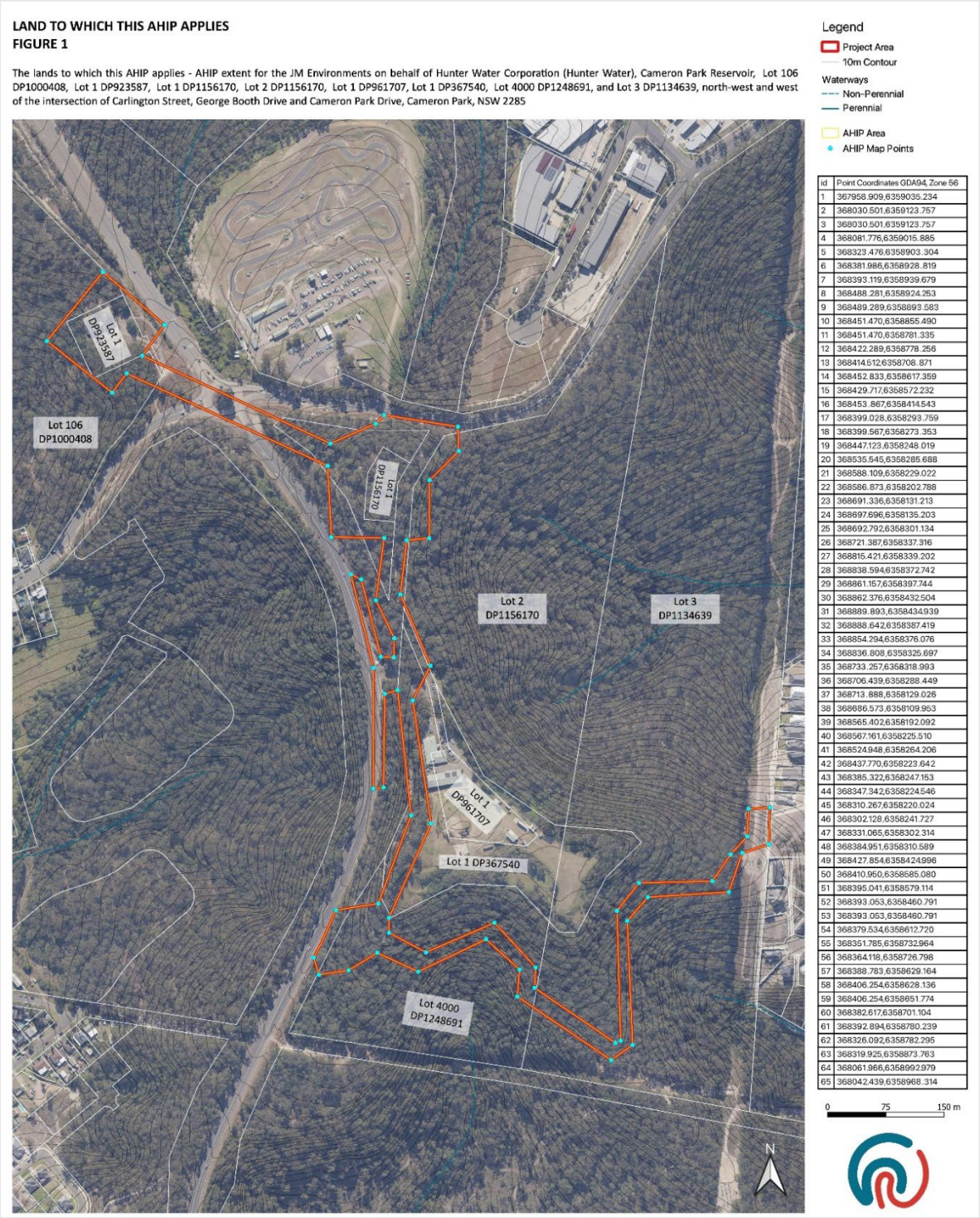
7.3 Mitigation and Management

Impacts to the site are to be mitigated by undertaking community collection under an AHIP, which is to sought and approved by Heritage NSW, and covers the entire Project Area (Figure 11). A summary of the process is provided in Table 10. The AHIP methodology is provided in the following section.

Table 10. Summary of proposed AHIP mitigation measures.

Mitigation and Measures	When it occurs	What occurs (summary)
Apply for Aboriginal Heritage Impact Permit from Heritage NSW	At least three months before intended ground disturbance start date	To be organised with heritage consultant by HWC or their contractor.
Community Collection	Post-AHIP approval and before works commence onsite	Removal of vegetation (cultural burn or hand-clearing) organised by HWC, followed by collection of Aboriginal artefacts by archaeologist and RAP team.
Artefact Storage and Ongoing Curation	Following collection of artefacts	Artefacts stored by archaeologists at Heritage Now office whilst a permanent location for artefacts is confirmed with RAPs. Heritage Now archaeologists, on behalf of HWC, organise either reburial of artefacts or the delivery of artefacts into a Care and Control agreement with a RAP group.

Mitigation and Measures	When it occurs	What occurs (summary)
AHIP works to be documented	Following artefact collection	The heritage consultant is to provide a report documenting the heritage works undertaken under the AHIP and fill out the relevant Aboriginal Site Impact Recording (ASIR) forms.
Heritage Induction	Post-AHIP approval before works commence onsite (ideally first day of site works)	Heritage Now personnel deliver a cultural heritage induction to site workers on the first day or works. A copy of this induction will be provided to the works foreman to deliver to any additional workers.
Unexpected Finds Procedure	Included within Heritage Induction	Processes for the recovery of unexpected finds (including human remains) communicated to site workers through the heritage induction.
Unexpected Finds Procedure—Human Remains	Included within Heritage Induction	Processes for the recovery of unexpected finds (including human remains) communicated to site workers through the heritage induction.



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5	368323.476,6358903.304
6	368381.986,6358928.819
7	368393.119,6358939.679
8	368488.281,6358924.253
9	368489.289,6358893.583
10	368451.470,6358855.490
11	368451.470,6358781.335
12	368422.289,6358778.256
13	368414.512,6358708.871
14	368452.833,6358617.359
15	368429.717,6358572.232
16	368453.867,6358414.543
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24	368697.696,6358135.203
25	368692.792,6358301.134
26	368721.387,6358337.316
27	368815.421,6358339.202
28	368838.594,6358372.742
29	368861.157,6358397.744
30	368862.376,6358432.504
31	368889.893,6358434.939
32	368888.642,6358387.419
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35	368733.257,6358318.993
36	368706.439,6358288.449
37	368713.888,6358129.026
38	368686.573,6358109.953
39	368565.402,6358192.092
40	368567.161,6358225.510
41	368524.948,6358264.206
42	368437.770,6358223.642
43	368385.322,6358247.153
44	368347.342,6358224.546
45	368310.267,6358220.024
46	368302.128,6358241.727
47	368331.065,6358302.314
48	368384.951,6358310.589
49	368427.854,6358424.996
50	368410.950,6358585.080
51	368395.041,6358579.114
52	368393.053,6358460.791
53	368393.053,6358460.791
54	368379.534,6358612.720
55	368351.785,6358732.964
56	368364.118,6358726.798
57	368388.783,6358629.164
58	368406.254,6358628.136
59	368406.254,6358651.774
60	368382.617,6358701.104
61	368392.894,6358780.239
62	368326.092,6358782.295
63	368319.925,6358873.763
64	368061.966,6358992.979
65	368042.439,6358968.314

Figure 11. Proposed AHIP boundary of the Project Area. (SIX Maps aerial with DTDB topography, DCDB Lot and DPs, and Heritage Now additions).

7.4 AHIP Methodology

The proposed term of the AHIP is 10 years, from the date of AHIP approval and the methodology for the AHIP is detailed below.

7.4.1 Community Collection

As demonstrated by the archaeological survey, visibility at the site is currently very low and the collection of artefacts will not be possible without prior removal of vegetation to increase visibility. The preferred method of vegetation removal is through a cultural burn by Aboriginal stakeholders, but if vegetation removal through hand-clearing is also possible if a cultural burn is not considered feasible.

Artefacts associated with AHIMS 38-4-0989 are to be collected by a qualified archaeologist in consultation with the RAPs post-AHIP approval. As part of this process, any identified surface artefacts will be flagged, their position will be recorded by GPS, and notes and photographs taken documenting their landform context. Collected artefacts will be permanently stored at a location decided upon during RAP consultation. The artefacts will be analysed and documented in a report to Heritage NSW and distributed to the RAPs.

7.4.2 Artefact Storage and Ongoing Curation

Any artefacts recovered through Aboriginal Community Collection (and any unexpected finds) will be placed in a secure and locked location with Heritage Now (Unit 1, 48 Kalaroo Road, Redhead 2280), until a Care and Control agreement has been granted between the proponent and Awabakal LALC, unless an alternative approach is agreed to by the majority of RAPs.

7.4.3 Heritage Induction

All on-site personnel are to be made aware of their obligations under the *National Parks and Wildlife Act* 1974 (NSW). This includes protection of Aboriginal sites and the reporting of any new Aboriginal, or suspected Aboriginal, heritage sites. This may be done through an on-site induction or other suitable format.

7.4.4 Unexpected Finds Procedure

If any unexpected Aboriginal objects are identified during works, works in that area should cease and the area cordoned off. An Aboriginal representative and a qualified archaeologist, are to assess the objects. If an object is identified to be Aboriginal, then they are to be collected in accordance with the Community Collection methodology, and the AHIMS register updated accordingly.

7.4.5 Human Remains

The AHIP will not cover harm to human remains. In the very unlikely event that human remains, or suspected human remains are uncovered during the development, then works in that area are to stop and the area is to be cordoned off. The Project Manager is to contact the NSW Police to establish whether the area is a crime scene. If it is not a crime scene, then Heritage NSW is to be notified via the Environment Line on 131 555, and management measures are to be devised in consultation with RAPs. Works are not to recommence in the area until the management measures have been implemented.

7.5 Consideration of Sustainable Development

Under the NSW *Protection of the Environmental Administration Act 1991* Ecologically sustainable development principles (ESD) are to be considered in the assessment of environmental impacts; and

this includes impacts to heritage. The consideration of ESD principles is required under the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in New South Wales 2010.* In particular, the precautionary principle and the principle of inter-generational equity are to be considered where there are proposed impacts to the environment (which includes heritage).

7.5.1 Precautionary Principle

The precautionary principle states that if there are threats of serious or irreversible damage to the environment, then a lack of full scientific certainty should not be used as a reason to postpone measures to prevent environmental degradation.

The proposed works do not pose a threat of serious or irreversible damage to the environment, all the surface artefact sites are represented elsewhere in the local area and the mitigation measures proposed provide acceptable conservation outcomes for the Aboriginal sites.

7.5.2 Inter-generational Equity & Cumulative Harm

The principle of inter-generational equity states that the present generation should ensure the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations. Cumulative harm is understanding how the cumulative effects of the Proposal.

The mitigation measures proposed will ensure that the Aboriginal sites are salvaged and conserved ex-situ and thus satisfies the principle of inter-generational equity.

7.5.3 Summary

This ACHA report is to be used as part of an AHIP application for community collection of AHIMS 38-4-0989 and other actions causing harm. The AHIP must be approved and the required heritage works undertaken before the commencement of ground disturbing works on the site. The ongoing AHIP conditions are to also to be abided by for the duration of the project.

8 Conclusions and Recommendations

The Project Area contains one AHIMS site that has cultural and archaeological values: AHIMS site 38-4-0989. It is representative of Aboriginal sites on a local level; however, the site is not rare and is of low research and educational potential. Overall, the site has low significance on a local and regional scale.

The location of AHIMS Site 38-4-0989was ground-truthed, but none of the seven associated artefacts were identified during survey. This is most likely due to splash and sheet erosion having likely moved the artefacts, or since recording they have been covered by additional leaf litter and vegetation. No additional sites or PADS were identified in the Project Area. However, this location is still protected under the *National Parks and Wildlife Act 1974* and thus an Aboriginal Heritage Impact Permit (AHIP) is required.

The following recommendations are to be followed.

Recommendation 1

This ACHA report is to be used as part of an AHIP application for community collection of AHIMS 38-4-0989 and other actions causing harm. The AHIP must be approved and required heritage works undertaken before the commencement of ground disturbing works on the site. The ongoing AHIP conditions are to also to be abided by for the duration of the project.

Recommendation 2

The processes outlined in the below table are to be followed for the proposed works.

Mitigation and Measures	When it occurs	What occurs (summary)
Apply for Aboriginal Heritage Impact Permit from Heritage NSW	At least three months before intended ground disturbance start date	To be organised with heritage consultant by HWC or their contractor.
Community Collection	Post-AHIP approval and before works commence onsite	Removal of vegetation (cultural burn or hand-clearing) organised by HWC, followed by collection of Aboriginal artefacts by archaeologist and RAP team.
Artefact Storage and Ongoing Curation	Following collection of artefacts	Artefacts stored by archaeologists at Heritage Now office whilst a permanent location for artefacts is confirmed with RAPs. Heritage Now archaeologists, on behalf of HWC, organise either reburial of artefacts or the delivery of artefacts into a Care and Control agreement with a RAP group.
AHIP works to be documented	Following artefact collection	The heritage consultant is to provide a report documenting the heritage works undertaken under the AHIP and fill out the relevant Aboriginal Site Impact Recording (ASIR) forms.
Heritage Induction	Post-AHIP approval	Heritage Now personnel deliver a cultural

Mitigation and Measures	When it occurs	What occurs (summary)
	before works commence onsite (ideally first day of site works)	heritage induction to site workers on the first day or works. A copy of this induction will be provided to the works foreman to deliver to any additional workers.
Unexpected Finds Procedure	Included within Heritage Induction	Processes for the recovery of unexpected finds (including human remains) communicated to site workers through the heritage induction.
Unexpected Finds Procedure—Human Remains	Included within Heritage Induction	Processes for the recovery of unexpected finds (including human remains) communicated to site workers through the heritage induction.

9 References

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OEH. 2011. *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in New South Wales*. Office of Environment and Heritage.

———. 2012. "Guide to Completing the AHIMS Site Recording Form." Sydney: Office of Environment and Heritage.

10 Plates

Plate 1. View north at towards the West Wallsend Valve House and Underground Reservoir. (Source: Heritage Now 2022)

Plate 2. View southeast across track in SU2, the context of artefact site AHIMS Site 38-4-0989. (Source: Heritage Now 2022).

Plate 3. View south along the gravel paths that characterise SU3. (Source: Heritage Now 2022

Appendix 1 Aboriginal Consultation

Contact	Organisation	Contacted by	Organisation	Method	Date	Comment/response
Agency Letter						
Peter Townsend	Awabakal Local Aboriginal Land Council	Nicola Roche	Hunter Water Corporation	Email	30/09/2020	
Sir/Madam	The Registrar, Aboriginal Land Rights Act 1983	Nicola Roche	Hunter Water Corporation	Email	30/09/2020	
Sir/Madam	Hunter Local Land Services	Nicola Roche	Hunter Water Corporation	Email	30/09/2020	
Aboriginal Cultural Heritage Regulation	Heritage NSW	Nicola Roche	Hunter Water Corporation	Email	30/09/2020	
Strategic Planning Team	Newcastle City Council	Nicola Roche	Hunter Water Corporation	Email	30/09/2020	
Sir/Madam	National Native Title Tribunal	Nicola Roche	Hunter Water Corporation	Email	30/09/2020	
Sir/Madam	Native Title Services Corporation (NTSCORP)	Nicola Roche	Hunter Water Corporation	Email	30/09/2020	
	Lake Macquarie City Council	Nicola Roche	Hunter Water Corporation	Email	27/10/2020	
Agency Letter Response						
Nicola Roche	Hunter Water Corporation	Madeline	National Native Title Tribunal	Email	30/09/2020	Sent email providing information for Native Title search if required. Native Title search conducted on 27/10/20 via Native Title Vision spatial system which showed that there are no registered claims over the project area

Contact	Organisation	Contacted by	Organisation	Method	Date	Comment/response
Nicola Roche	Hunter Water Corporation	Peter Townsend	Awabakal Local Aboriginal Land Council	Email	01/10/2020	Registers interest in project
Nicola Roche	Hunter Water Corporation	Rosalie Neve	Heritage NSW	Email	08/10/2020	Sent list of known Aboriginal parties for Lake Macquarie LGA
Nicola Roche	Hunter Water Corporation		Hunter Local Land Services	Email	15/10/2020	Advised contacting the Local Aboriginal Land Council
Nicola Roche	Hunter Water Corporation		Newcastle City Council	Email		Identified that works are within Lake Macquarie LGA
Nicola Roche	Hunter Water Corporation	Patricia Kinney	Lake Macquarie City Council	Email	16/11/2020	Advised contacting Awabakal LALC, Awabakal Traditional Owners Aboriginal Corporation, Awabakal Descendents Traditional Owners Aboriginal Corporation, Lower Hunter Aboriginal Incorporated, and Awabakal and Guringai
Expressions of Interest Letters						
Carolyn Hickey	A1 Indigenous Services	Nicola Roche	Hunter Water Corporation	Email	27/10/2020	
Aliera French	Aliera French Trading	Nicola Roche	Hunter Water Corporation	Email	27/10/2020	
Darren McKenny	Arwarbukarl Cultural Resource Association, Miromaa Aboriginal Language and Technology Centre	Nicola Roche	Hunter Water Corporation	Email	27/10/2020	

Contact	Organisation	Contacted by	Organisation	Method	Date	Comment/response
Tracey Howie & Kerrie Brauer	Awabakal & Guringai Pty Ltd	Nicola Roche	Hunter Water Corporation	Email	27/10/2020	
Peter Leven	Awabakal Descendants Traditional Owners	Nicola Roche	Hunter Water Corporation	Email	27/10/2020	
Kerrie Brauer	Awabakal Traditional Owners Aboriginal Corporation	Nicola Roche	Hunter Water Corporation	Email	27/10/2020	
Nola, Darren and Ralph Hampton	B-H Heritage Consultants	Nicola Roche	Hunter Water Corporation	Email	27/10/2020	
Marilyn Carroll-Johnson	Corroboree Aboriginal Corporation	Nicola Roche	Hunter Water Corporation	Email	27/10/2020	
Jeffery Matthews	Crimson-Rosie	Nicola Roche	Hunter Water Corporation	Email	27/10/2020	
Daniella Chedzey	Daniella Chedzey & Jessica Wegener	Nicola Roche	Hunter Water Corporation	Email	27/10/2020	
Deslee Matthews	Deslee Talbott Consultants	Nicola Roche	Hunter Water Corporation	Email	27/10/2020	
Paul Boyd & Lilly Carroll	Didge Ngunawal Clan	Nicola Roche	Hunter Water Corporation	Email	27/10/2020	
Deidre Perkins	Divine Diggers Aboriginal Cultural Consultants	Nicola Roche	Hunter Water Corporation	Email	27/10/2020	
Craig Horne Debbie Dacey- Sullivan	Gidawaa Walang & Barkuma Neighbourhood Centre Inc.	Nicola Roche	Hunter Water Corporation	Email	27/10/2020	
Tracey Howie	Guringai Tribal Link Aboriginal Corporation	Nicola Roche	Hunter Water Corporation	Email	27/10/2020	
Craig Archibald	Indigenous Learning	Nicola Roche	Hunter Water Corporation	Email	27/10/2020	

Contact	Organisation	Contacted by	Organisation	Method	Date	Comment/response
Norm Archibald	Jumbunna Traffic Management Group Pty Ltd	Nicola Roche	Hunter Water Corporation	Email	27/10/2020	
Jill Green	Kauma Pondee Inc.	Nicola Roche	Hunter Water Corporation	Email	27/10/2020	
Arthur Fletcher	Kawul Pty Ltd trading as Wonn1 Sites	Nicola Roche	Hunter Water Corporation	Email	27/10/2020	
David Ahoy	Lower Hunter Aboriginal Incorporated	Nicola Roche	Hunter Water Corporation	Email	27/10/2020	
Lea-Anne Ball	Lower Hunter Wonnarua Cultural Services	Nicola Roche	Hunter Water Corporation	Email	27/10/2020	
Michael Green	Michael Green Cultural Heritage Consultant	Nicola Roche	Hunter Water Corporation	Email	27/10/2020	
Ryan Johnson & Darleen Johnson-Carroll	Murra Bidgee Mullangari Aboriginal Corporation	Nicola Roche	Hunter Water Corporation	Email	27/10/2020	
Warren Schillings	Myland Cultural & Heritage Group	Nicola Roche	Hunter Water Corporation	Email	27/10/2020	
Des Hickey	Wattaka Wonnarua CC Service	Nicola Roche	Hunter Water Corporation	Email	27/10/2020	
Steven Hickey	Widescope Indigenous Group	Nicola Roche	Hunter Water Corporation	Email	27/10/2020	
Richard Edwards	Wonnarua Elders Council	Nicola Roche	Hunter Water Corporation	Email	27/10/2020	

Contact	Organisation	Contacted by	Organisation	Method	Date	Comment/response
Scott Franks	Yarrawalk (A division of Tocomwall Pty Ltd), Tocomwall Pty Ltd on behalf of Scott Franks and Anor on behalf of the Plains Clans of the Wonnarua People	Nicola Roche	Hunter Water Corporation	Email	27/10/2020	
Kathleen Steward-Kinchela	Yinarr Cultural Services	Nicola Roche	Hunter Water Corporation	Email	27/10/2020	
Kevin Duncan	Individual	Nicola Roche	Hunter Water Corporation	Email	27/10/2020	
Sharon Hodgetts	Individual	Nicola Roche	Hunter Water Corporation	Email	27/10/2020	
Kyle Howie	Individual	Nicola Roche	Hunter Water Corporation	Email	27/10/2020	
Tim Selwyn	Individual	Nicola Roche	Hunter Water Corporation	Email	27/10/2020	
Tamara Towers	Individual	Nicola Roche	Hunter Water Corporation	Email	27/10/2020	
Yvette and Jackson Walker	Individuals	Nicola Roche	Hunter Water Corporation	Email	27/10/2020	
Roger Matthews	Roger Matthews Consultancy	Nicola Roche	Hunter Water Corporation	Post	28/10/2020	
Trudy Smtih	Individual	Nicola Roche	Hunter Water Corporation	Post	03/11/2020	
Expressions of Interest Responses						
Nicola Roche	Hunter Water Corporation	Anne Andrews	Individual	Email		Requests further information
Nicola Roche	Hunter Water Corporation	Arthur Fletcher	Kawul Pty Ltd trading as Wonn1 Sites	Email	27/10/2020	Registers interest
Nicola Roche	Hunter Water Corporation	Tracey Howie & Kerrie Brauer	Awabakal & Guringai Pty Ltd	Email	27/10/2020	Registers interest

Contact	Organisation	Contacted by	Organisation	Method	Date	Comment/response
Nicola Roche	Hunter Water Corporation	Paul Boyd & Lilly Carroll	Didge Ngunawal Clan	Email	27/10/2020	Registers interest
Nicola Roche	Hunter Water Corporation	Scott Franks	Yarrawalk (A division of Tocomwall Pty Ltd), Tocomwall Pty Ltd on behalf of Scott Franks and Anor on behalf of the Plains Clans of the Wonnarua People	Email	27/10/2020	Registers interest
Nicola Roche	Hunter Water Corporation	Kerrie Brauer	Awabakal Traditional Owners Aboriginal Corporation	Email	28/10/2020	Registers interest
Nicola Roche	Hunter Water Corporation	Norm Archibald	Jumbunna Traffic Management Group Pty Ltd	Email	02/11/2020	Registers interest
Nicola Roche	Hunter Water Corporation	David Ahoy	Lower Hunter Aboriginal Incorporated	Email	02/11/2020	Registers interest
Nicola Roche	Hunter Water Corporation	Steven Hickey	Widescope Indigenous Group	Email	03/11/2020	Registers interest
Nicola Roche	Hunter Water Corporation	Peter Leven	Awabakal Descendants Traditional Owners	Email	05/11/2020	Registers interest
Nicola Roche	Hunter Water Corporation	Carolyn Hickey	A1 Indigenous Services	Email	07/11/2020	Registers interest
Project Updates						
Carolyn Hickey	A1 Indigenous Services	Ashley O'Sullivan	Hunter Water Corporation	Email	30/03/2021, 28/09/2021, 26/10/2021	

Contact	Organisation	Contacted by	Organisation	Method	Date	Comment/response
Tracey Howie	Awabakal & Guringai Pty Ltd	Ashley O'Sullivan	Hunter Water Corporation	Email	30/03/2021, 28/09/2021, 26/10/2021	
Peter Leven	Awabakal Descendants Traditional Owners Aboriginal Corporation	Ashley O'Sullivan	Hunter Water Corporation	Email	30/03/2021, 28/09/2021, 26/10/2021	
Peter Townsend	Awabakal Local Aboriginal Land Council	Ashley O'Sullivan	Hunter Water Corporation	Email	30/03/2021, 28/09/2021, 26/10/2021	
Kerrie Brauer	Awabakal Traditional Owners Aboriginal Corporation	Ashley O'Sullivan	Hunter Water Corporation	Email	30/03/2021, 28/09/2021, 26/10/2021	
Paul Boyd & Lilly Carroll	Didge Ngunawal Clan	Ashley O'Sullivan	Hunter Water Corporation	Email	30/03/2021, 28/09/2021, 26/10/2021	
Norm Archibald	Jumbunna Traffic Management Group Pty Ltd	Ashley O'Sullivan	Hunter Water Corporation	Email	30/03/2021, 28/09/2021, 26/10/2021	

Contact	Organisation	Contacted by	Organisation	Method	Date	Comment/response
Arthur Fletcher	Kawul Pty Ltd trading as Wonnl Sites	Ashley O'Sullivan	Hunter Water Corporation	Email	30/03/2021, 28/09/2021, 26/10/2021	
David Ahoy	Lower Hunter Aboriginal Incorporated	Ashley O'Sullivan	Hunter Water Corporation	Email	30/03/2021, 28/09/2021, 26/10/2021	
Steven Hickey	Widescope Indigenous Group	Ashley O'Sullivan	Hunter Water Corporation	Email	30/03/2021, 28/09/2021, 26/10/2021	
Scott Franks	Yarrawalk (A division of Tocomwall Pty Ltd), Tocomwall Pty Ltd on behalf of Scott Franks and Anor on behalf of the Plains Clans of the Wonnarua People NSD1680/2013	Ashley O'Sullivan	Hunter Water Corporation	Email	30/03/2021, 28/09/2021, 26/10/2021	
Methodology Letter sent						
Carolyn Hickey	A1 Indigenous Services	Joven Sanchez	Heritage Now	Email	17/12/2021	
Tracey Howie	Awabakal & Guringai Pty Ltd	Joven Sanchez	Heritage Now	Email	17/12/2021	

Contact	Organisation	Contacted by	Organisation	Method	Date	Comment/response
Peter Leven	Awabakal Descendants Traditional Owners Aboriginal Corporation	Joven Sanchez	Heritage Now	Email	17/12/2021	
Peter Townsend	Awabakal Local Aboriginal Land Council	Joven Sanchez	Heritage Now	Email	17/12/2021	
Kerrie Brauer	Awabakal Traditional Owners Aboriginal Corporation	Joven Sanchez	Heritage Now	Email	17/12/2021	
Paul Boyd & Lilly Carroll	Didge Ngunawal Clan	Joven Sanchez	Heritage Now	Email	17/12/2021	
Norm Archibald	Jumbunna Traffic Management Group Pty Ltd	Joven Sanchez	Heritage Now	Email	17/12/2021	
Arthur Fletcher	Kawul Pty Ltd trading as Wonnl Sites	Joven Sanchez	Heritage Now	Email	17/12/2021	
David Ahoy	Lower Hunter Aboriginal Incorporated	Joven Sanchez	Heritage Now	Email	17/12/2021	
Steven Hickey	Widescope Indigenous Group	Joven Sanchez	Heritage Now	Email	17/12/2021	
Scott Franks	Yarrawalk (A division of Tocomwall Pty Ltd), Tocomwall Pty Ltd on behalf of Scott Franks and Anor on behalf of the Plains Clans of the Wonnarua People NSD1680/2013	Joven Sanchez	Heritage Now	Email	17/12/2021	
Methodology Responses						

Contact	Organisation	Contacted by	Organisation	Method	Date	Comment/response
Joven Sanchez	Heritage Now	Carolyn Hickey	A1 Indigenous Services	Email	10/01/2022	Supports info and methodology
Joven Sanchez	Heritage Now	Kerrie Brauer	Awabakal Traditional Owners Aboriginal Corporation	Email	31/01/2022	Agrees with the methodology
Notification Letter						
	Heritage NSW	Nicola Roche	Hunter Water Corporation	Email	19/11/2020	
	Awabakal Local Aboriginal Land Council	Nicola Roche	Hunter Water Corporation	Email	19/11/2020	

Appendix 2 AHIMS Search Results

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : HN314-A Cameron Park

Client Service ID : 619534

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
38-4-0606	NL-IF-8	AGD	56	369592	6358378	Open site	Valid	Artefact : -		4448
	Contact	**Recorders**	Mary Dallas Consulting Archaeologists (MDCA),Mrs.Robynne Mills,Mr.Paul Irish					**Permits**		
38-4-0771	Cocked Hat Creek 5	AGD	56	369688	6358405	Open site	Valid	Artefact : 2		
	Contact	**Recorders**	Umwelt (Australia) Pty Limited - Individual users					**Permits**		
38-5-0182	NL-OS-1	AGD	56	369830	6358045	Open site	Valid	Artefact : 9	Open Camp Site	
	Contact	**Recorders**	Mary Dallas Consulting Archaeologists (MDCA),Mrs.Robynne Mills,Mr.Paul Irish					**Permits**	3602	
38-4-0989	Cameron Park	AGD	56	368270	6358660	Open site	Valid	Artefact : -		
	Contact T Russell	**Recorders**	Mr.Edward Clarke					**Permits**	2820,2821	
38-4-0138	Site 4;	AGD	56	367900	6359200	Open site	Valid	Stone Arrangement : -	Stone Arrangement	1221,98165,98218,100916
	Contact	**Recorders**	Denise Donlon					**Permits**		
38-4-1141	NL-IF-1 (Wallsend)	GDA	56	368580	6358020	Open site	Valid	Artefact : -		4708
	Contact	**Recorders**	Mrs.Robynne Mills					**Permits**	3522	
38-4-1016	GBD-ST-2	AGD	56	367730	6357630	Open site	Valid	Modified Tree (Carved or Scarred) : 1		
	Contact T Russell	**Recorders**	Mrs.Robynne Mills					**Permits**		
38-5-0187	NL-OS-2	AGD	56	369700	6358185	Open site	Valid	Artefact : 2	Isolated Find	
	Contact	**Recorders**	Mary Dallas Consulting Archaeologists (MDCA),Mrs.Robynne Mills,Mr.Paul Irish					**Permits**	3602	
38-5-0181	NL-IF-2	AGD	56	369758	6358143	Open site	Valid	Artefact : -	Isolated Find	
	Contact	**Recorders**	Mary Dallas Consulting Archaeologists (MDCA),Mrs.Robynne Mills,Mr.Paul Irish					**Permits**		
38-5-0189	NL-IF-1	AGD	56	369839	6358948	Open site	Valid	Artefact : -	Isolated Find	98458,98459
	Contact	**Recorders**	Mary Dallas Consulting Archaeologists (MDCA),Mrs.Robynne Mills,Mr.Paul Irish					**Permits**	3602	
38-4-1842	Restriction applied. Please contact ahims@environment.nsw.gov.au.					Open site	Valid			
	Contact	**Recorders**	Awabakal LALC,Mr.Peter Townsend					**Permits**		
38-4-0394	Seahampton 1 Grinding Groove Site	AGD	56	368470	6359680	Open site	Valid	Grinding Groove : 17	Axe Grinding Groove	98165,98218
	Contact	**Recorders**	Doctor.Julie Dibden,Umwelt (Australia) Pty Limited - Individual users,Leila McAdar					**Permits**		
38-5-0180	NL-IF-3	AGD	56	369580	6357790	Open site	Valid	Artefact : -	Isolated Find	98458,98459
	Contact	**Recorders**	Mrs.Robynne Mills					**Permits**		
38-4-1017	Restriction applied. Please contact ahims@environment.nsw.gov.au.					Closed site	Valid			
	Contact T Russell	**Recorders**	Mrs.Robynne Mills					**Permits**		
38-4-1364	Minmi Creek RTA 4 IF	GDA	56	368588	6359792	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Umwelt (Australia) Pty Limited - Individual users,Mr.Kirwan Williams					**Permits**		
38-5-0183	NL-IF-4	AGD	56	369337	6358328	Open site	Valid	Artefact : -	Isolated Find	
	Contact	**Recorders**	Mary Dallas Consulting Archaeologists (MDCA),Mrs.Robynne Mills,Mr.Paul Irish					**Permits**	3404	

Report generated by AHIMS Web Service on 03/09/2021 for Trishia Palconit for the following area at Lat, Long From : -32.91, 151.58 - Lat, Long To : -32.89, 151.61. Number of Aboriginal sites and Aboriginal objects found is 18

This information is not guaranteed to be free from error omission. Heritage NSW and its employees disclaim liability for any act done or omission made on the information and consequences of such acts or omission.

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : HN314-A Cameron Park

Client Service ID : 619534

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
38-4-1294	GBD-IF-1	AGD	56	367987	6357684	Open site	Valid	Artefact : 1		
	Contact	**Recorders**	Mills Archaeological & Heritage Services Pty Ltd					**Permits**		
38-4-1363	Minmi Creek RTA 3 IF	GDA	56	368369	6359467	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Umwelt (Australia) Pty Limited - Individual users,Mr.Kirwan Williams					**Permits**		

**** Site Status**

Valid - The site has been recorded and accepted onto the system as valid

Destroyed - The site has been completely impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There is nothing left of the site on the ground but proponents should proceed with caution.

Partially Destroyed - The site has been only partially impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There might be parts or sections of the original site still present on the ground

Not a site - The site has been originally entered and accepted onto AHIMS as a valid site but after further investigations it was decided it is NOT an aboriginal site. Impact of this type of site does not require permit but Heritage NSW should be notified

Report generated by AHIMS Web Service on 03/09/2021 for Trishia Palconit for the following area at Lat, Long From : -32.91, 151.58 - Lat, Long To : -32.89, 151.61. Number of Aboriginal sites and Aboriginal objects found is 18

This information is not guaranteed to be free from error omission. Heritage NSW and its employees disclaim liability for any act done or omission made on the information and consequences of such acts or omission.

Appendix E Ecological Assessment Report

ECOLOGY | BIOBANKING | OFFSETS | BUSHFIRE

Ecological Assessment Report

Cameron Park Reservoir

Prepared for: **Hunter Water Corporation**

22 June 2022

AEP Ref: **2430**

Revision: **02**

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Document Control

Document Name	Ecological Assessment Report for Cameron Park Reservoir
Project Number	2430
Client Name	Hunter Water
Principal Reviewer / Certifier	Craig Anderson
AEP Project Team	Lucy Knutson Craig Anderson

Version

Revision	Date	Author	Reviewed	Approved
00	05/09/2021	Lucy Knutson	Craig Anderson	Craig Anderson
01	15/03/2022	Lucy Knutson	Lucy Knutson	Lucy Knutson
02	23/06/2022	Lucy Knutson	Ian Benson	Ian Benson

Distribution

Revision	Date	Name	Organisation
00	05/09/2021	James McMahon	JM Environments
01	15/03/2022	James McMahon	JM Environments
02	23/06/2022	James McMahon	JM Environments

EXECUTIVE SUMMARY

At the request of JE Environments on behalf of Hunter Water Corporation (HWC) (the client), Anderson Environment & Planning (AEP) have undertaken the necessary investigations to inform the production of an Ecological Assessment Report (EAR) to support the proposed Cameron Park Reservoir at the corner of Cameron Park Drive and George Booth Drive, Cameron Park, NSW (Subject Site).

The Subject Site (area of proposed activity) occurs within the Lake Macquarie City Council LGA and is zoned E2 - Environmental Conservation and SP2 – Infrastructure.

The activity is planned to occur within lands that have been established as an offset site. The offset land is proposed to be dedicated to Council by Hammersmith Management Pty Ltd following the 10-year maintenance period in accordance with a Voluntary Planning Agreement (VPA).

Ground-truthing of the site identified that the vegetation therein was commensurate with;

- PCT 1589 - *Spotted Gum - Broad-leaved Mahogany - Grey Gum grass - shrub open forest on Coastal Lowlands of the Central Coast;* and
- PCT 1619 - *Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands.*

Approx. 1.32ha of PCT 1589 and 0.93ha of PCT 1619 is proposed to be modified or removed. While the reservoir site and accessway from George Booth Drive will be permanently cleared as a result of construction of the reservoir and driveway, vegetation removed along the water mains alignment will be rehabilitated.

One (1) threatened flora species, *Tetratheca juncea* (Black-eyed Susan) was identified during targeted field surveys undertaken during the peak flowering period. A total of 29 clumps were found, 14 occurring with the Subject Site while 15 were located outside the Subject Site boundary. The 14 clumps found with the Subject Site boundary and will be impacted by the proposal. Despite this, it is not expected to cause a significant impact to the species given the high-quality of suitable vegetation surrounding the site, linear nature of the activity and plans to rehabilitate the impacted vegetation. It is assumed the species also occupies suitable habitat on adjacent lands.

Consideration of the EPBC Act revealed that the removal of *Tetratheca juncea* will impact on a Matter of National Environmental Significance (MNES), and as such a referral to the Department is recommended.

No other MNES (specifically in this instance threatened species, threatened ecological communities or listed migratory species) are expected to be impacted upon significantly as a result of the proposal.

No threatened fauna species were recorded within the Subject Site.

The current vegetation on site has good connectivity to the surrounding landscape in all directions although roads acting as potential barriers for less mobile species exist to the north and west.

This assessment has been undertaken in accordance with the Environmental Planning and Assessment Act 1979 (EP&A Act) as well as the *Biodiversity Conservation Act, 2016,* and *Environmental Protection and Biodiversity Conservation Act, 1999*. Assessment under the '5-part test' determined that no significant impacts upon threatened entities listed under the NSW BC Act are likely to occur if mitigation measures are implemented.

General recommendations and mitigation measures have been included in the report to minimise environmental impacts of the proposal. These measures should provide adequate protection during the construction phase for native flora and fauna in the locality.

Contents

Tables

Figures

Appendices

1.0 Introduction

At the request of JM Environments (JME) on behalf of Hunter Water Corporation (HWC) (the client), Anderson Environment & Planning (AEP) have undertaken the necessary investigations to inform the production of an Ecological Assessment Report (EAR) to support the proposed Cameron Park Reservoir at the corner of Cameron Park Drive and George Booth Drive, Cameron Park, NSW (Subject Site).

This report is specifically intended to indicate the likelihood of the proposal to have a significant impact on threatened species or ecological communities. In this regard, the report aims to recognise the relevant requirements of the *Environmental Planning & Assessment Act 1979*, the *Biodiversity Conservation Act, 2016* (NSW) (BC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act). The reservoirs and watermain will be owned and operated by Hunter Water Corporation (HWC) and therefore does not require development consent but rather an assessment under Part 5 of the Environmental Planning & Assessment Act 1979.

The purpose of this report is to:

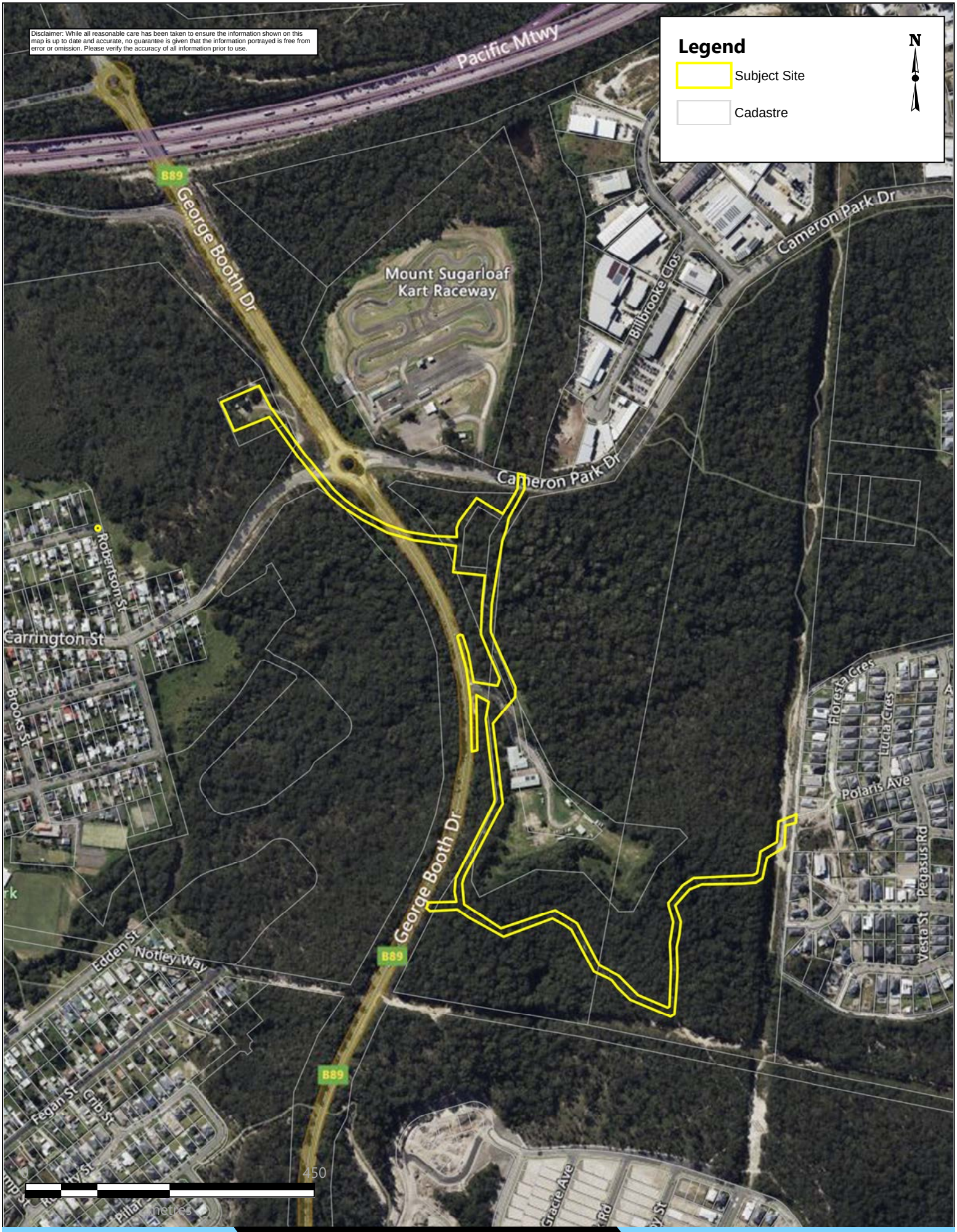
- Describe the ecological values of the Subject Site;
- Assess the potential for threatened species to utilise the area; and
- Assess ecological impacts associated with the proposal against relevant legislation.

Potential ecological impacts on native species in general are also considered, as are recommendations for minimising any impacts within the scope of the activity.

2.0 Site Particulars

- **Address** – The various addresses around the intersection of Cameron Park Drive and George Booth Drive including:
    - 30A George Booth Drive West Wallsend;
    - 11 Robertson Street West Wallsend;
    - 4 Cameron Park Drive Cameron Park
    - 6 Cameron Park Drive Cameron Park;
    - 1A George Booth Drive West Wallsend;
    - 26 Comel Avenue Cameron Park; and
    - Cameron Park Drive Cameron Park,
- **Lot Numbers:**
    - Lot 1 DP923587;
    - Lot 6 DP1180029;
    - Lot 2 DP1156170;
    - Lot 1 DP1156170;
    - Lot 1 DP961707;
    - Lot 1 DP367540;
    - Lot 2999 DP1260247; and
    - Lot 3 DP1134639
- **LGA** – Lake Macquarie Council LGA.
- **Subject Site** –The proposed site for Cameron Park Reservoirs 1 and 2 which is situated at the corner of Cameron Park Drive and George Booth Drive (Lot 1 DP 1156170), West Wallsend Reservoir 1 and West Wallsend 1 Hydro tank/ Wastewater Pump Station (WPS) (Lot 1 DP 923587) both to be decommissioned and the land proposed for the new watermain which comprises an access track through remnant vegetation. The area proposed for the new reservoirs contains relatively consistent native remnant vegetation present in a moderate quality condition, some clearing has been undertaken to create informal access tracks. The land proposed for the new watermain alignment comprises an access track which winds through moderate and high-quality vegetation. Part of the Subject Site been established as an offset site. The offset land is proposed to be dedicated to Council by Hammersmith Management Pty Ltd following the 10-year maintenance period in accordance with a Voluntary Planning Agreement (VPA).
- **Zoning** – *Lake Macquarie Local Environmental Plan 2014 (LEP) 2014*, E2 - Environmental Conservation and SP2 – Infrastructure.
- **Surrounding Land Use** – The Subject Site is bounded on all sides by contiguous native remnant vegetation. Cameron Park Drive is to the north and George Booth Drive is to the East. To the west is the residential area of Cameron Park.

Figure 1 depicts the extent of the Subject Site.



AEP

Title: Figure 1 - Site Location Map

Date: June 2022

Location: Cameron Park, NSW

Client: Hunter Water

AEP Ref: 2430

3.0 Proposal

The West Wallsend/Edgeworth/Minmi area is part of the West Lake Macquarie Water System. It is Lake Macquarie's main area of residential development in the short to medium term. Approximately 7,300 new residential properties are expected to be developed from two major developments; Northlakes and Minmi.

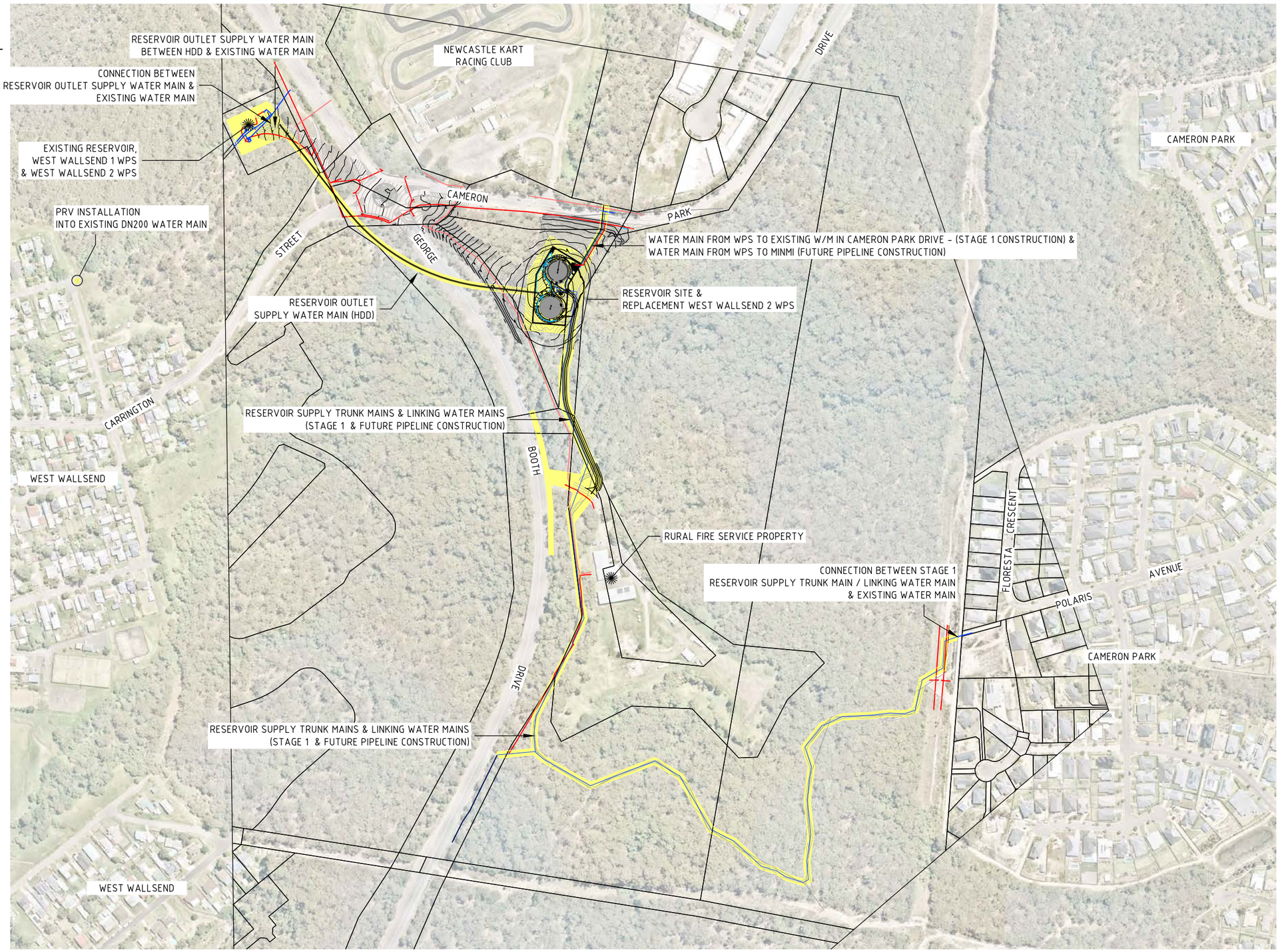
With the impending growth of residential development within the West Wallsend/Edgeworth area, Hunter Water Corporation (HWC) has prepared a regional servicing strategy in 2018. This strategy identified network augmentation required for increased capacity to service the planned growth. The proposal comprises of:

- a new 6.5ML reservoir storage site,
- new trunk mains (water mains) that will link the Cameron Park 2 Zone and the West Wallsend area via a new pressure reducing valve (PRV).

The new system will be able to service West Wallsend including the elevated areas fed by gravity from the new Cameron Park Reservoirs. The Cameron Park 2 Water Pump Station (WPS) will feed the new reservoirs.

The reservoir site will be constructed in a staged approach. The first reservoir, Cameron Park 1 Reservoir, of 3.25ML will service growth to 2030. The second reservoir, Cameron Park 2 Reservoir, of 3.25ML will service growth beyond 2030.

Figure 2 depicts the proposed plan within the Subject Site.



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LEGEND:

- WATER MAIN
- HV — ELECTRICITY (U/G)
- OHP — ELECTRICITY (O/H)
- W — EXISTING WATER MAIN
- OHP — EXISTING ELECTRICITY (O/H)
- LV — EXISTING ELECTRICITY (U/G)
- OFC — EXISTING TELECOMMUNICATIONS (OFC)
- SW — EXISTING STORMWATER
- IMPACT AREA

No.	REVISION DETAILS	DWN	DATE
A	INFORMATION	CT	21/06/22

VERSION 4

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HUNTER WATER

DESIGNED: –	DATE: –	COMPANY: –	
DRAWN: –	DATE: –	COMPANY: –	
CHECKED: –	DATE: –	COMPANY: –	
APPROVED: –	DATE: –	COMPANY: –	

TITLE:
CS1175 - SR00156
CAMERON PARK RESERVOIRS
WR-CRE-001 RES AND WR-CPE-002 RES
CONCEPT DESIGN
'REF IMPACT AREA'

SIZE:	SCALE:	INDEX No.	DRAWING No.	SHEET	REV No.
A3	1:5000		–	–	A

Plot Date: 22/06/22 - 08:49 Cad File: P:\HWC\10000 HWC Partnership\10156 Cameron Park Reservoir\2. Tasks\4. Survey and Services Location\2. Current Working\(REF IMPACT AREA).dwg

4.0 Scope and Purpose

Investigations were carried out at the site and via literature / database searches to gather information required to adequately address the requirements of the *Environmental Planning & Assessment Act 1979*, the *Biodiversity Conservation Regulation 2017* (BCR), as well as *Section 7.3* of the BC Act (known as the "5-part test").

Also afforded consideration were the *Commonwealth EPBC Act*.

The assessment approach was tailored to ensure that legislative requirements were met relating to threatened species and native species in general for the proposed activity. This was achieved by background research and literature review, database searches, consultation, targeted ecological fieldwork and mapping, detailed habitat assessment, and ultimately impact assessment against the type and form of the proposal.

Specifically, the scope of this study is to:

- Identify vascular plant species occurring within the site, including any threatened species listed under the *BC Act* or *EPBC Act*;
- Identify and map the extent of vegetation communities within the site;
- Identify any fauna species, including threatened and migratory species, and populations or their habitats, which occur within the site and are known to occur in the wider locality;
- Assess the potential of the proposed activity to have a significant impact on any threatened species, populations or ecological communities (or their habitats) identified from the site; and
- Describe measures to be implemented to avoid, minimise, manage or monitor potential impacts of the proposal.

In addition to the survey work conducted within the Subject Site and general assessment of its immediate surrounds, consideration has been afforded to the wider locality, via database searches within 10km of the site and via appreciation of habitat areas that may be linked ecologically to the site.

5.0 Methodology

5.1 Information Sources

Information and spatial data provided within this EAR has been compiled from various sources including:

- Aerial Photograph Interpretation (API) of the site and surrounding locality;
- *NSW Biodiversity Value Map* (October 2021);
- Lower Hunter Vegetation Mapping (SEWPaC 2013);
- State survey guidelines (DEC 2004; OEH 2016 DPIE 2020a; DPIE 2020b);
- Niche (2020) *Part Lot 7000 DP1257121 – Management Plan – Edgeworth Offset Lan, Prepared for Hammersmith Management Pty Ltd* dated 27 March 2020;
- Niche (2020) *Lot 2 DP1156170 – Management Plan – Edgeworth Offset Lan, Prepared for Hammersmith Management Pty Ltd* dated 27 March 2020;
- OEH Threatened Species, Populations and Ecological Communities website (*https://www.environment.nsw.gov.au/AtlasApp/UI_Modules/TSM_/Default.aspx?a=1*) (July 2021); and
- Collective knowledge gained from previous ecological survey and assessment in the area over the past 25 years.

In addition, database searches were carried out, namely:

- Review of flora and fauna records held by the NSW Office of Environment & Heritage (OEH) Atlas of NSW Wildlife within a 10km radius of the site (June 2022); and
- Review of flora and fauna records held by the Commonwealth Department of Energy and Environment (DoEE) Protected Matters Search within a 5km radius of the Subject Site (June 2022).

5.2 Field Survey

The field surveys for the site have been prepared and performed with due recognition of the State survey guidelines.

The assessment approach was tailored to undertake sufficient works to ensure that legislative requirements were met relating to threatened species and native species in general for the proposed specific activity. Where any potential doubt remained over species impact, presence within the site was assumed to ensure that a conservative approach was employed.

5.2.1 Vegetation Communities

Vegetation was surveyed utilising a variety of methods, as outlined below.

- Regional mapping for the site using Lower Hunter Vegetation Mapping (SEWPaC 2013);
- Aerial Photo interpretation (API) to identify any notable variations within the site;
- Consultation of 1:25,000 topographic map series for the area;
- Inspection of the site to ground truth the unit(s) identified; and
- Identification of the vegetation map unit occurred via identification of required dominant species in community structural layers.

The final derived vegetation map was based on dominant species present in the over-storey, shrub and ground layers. The dominant species composition, structural and physical attributes were all considered when assigning the best fit ecological communities.

Consideration was given to the potential for the derived vegetation communities to constitute EECs as listed under the BC Act and/or EPBC Act. The floristic composition, geomorphological characteristics and geographical extent were important considerations in this process.

5.2.2 Flora

A general flora survey was undertaken to produce a flora species list for the site, to search specifically for threatened flora species known from the wider locality, and to gather data necessary to both derive vegetation community type(s) and to meet relevant survey guidelines. Such works included:

- Identification of all vascular plant species encountered during fieldwork;
- Vegetation Community Identification;
- Site coverage was systematic to ensure all key points of the Subject Site were assessed, and the Random Meander Technique (Cropper, 1993) was also utilised to maximise species encountered; and
- A systematic approach to target threatened plants species at the site as per the NSW Guide to Surveying Threatened Plants (2020).

5.2.3 Habitat

An assessment of the relative habitat values present within the Subject Site was carried out. This assessment focused primarily on the identification of specific habitat types and resources within the Subject Site favoured by known threatened species from the region. The assessment also considered the potential value of the Subject Site (and surrounding areas) for all major guilds of native flora and fauna.

The 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.

In particular, focus was put on documenting the presence of key habitat features such as tree hollows.

5.2.4 Fauna

Fauna surveys have been carried out utilising techniques as outlined below**.** Fauna survey work was undertaken with reference to relevant guidelines and to add additional information to the generated Expected Fauna Species List (**Appendix C**).

Mammals

The occurrence of mammals within the site was assessed by utilising habitat assessment as an analogue for presence. Such habitat includes foraging resources (blossom, herbaceous, prey etc), hollows and roosting opportunity, connectivity and water as outlined in **Section 6.2.3** above. Nine (9) hollow-bearing trees were present within the Subject Site. See **Figure 4**.

Avifauna Surveys

The presence of avifauna on site was carried out via bird surveys and incidental observations during all other phases of fieldwork. Surveys also involved habitat assessment including a hollow bearing tree search and searches for stick nests.

Two (2) diurnal bird survey was undertaken within the Subject Site from a census point for a minimum of 30 minutes.

Incidental Observations & Secondary Indications

Incidental records of any fauna species observed during fieldwork were noted. This included opportunistic sightings of secondary indications (scratches, scats, diggings, tracks etc.) of any resident or migratory species.

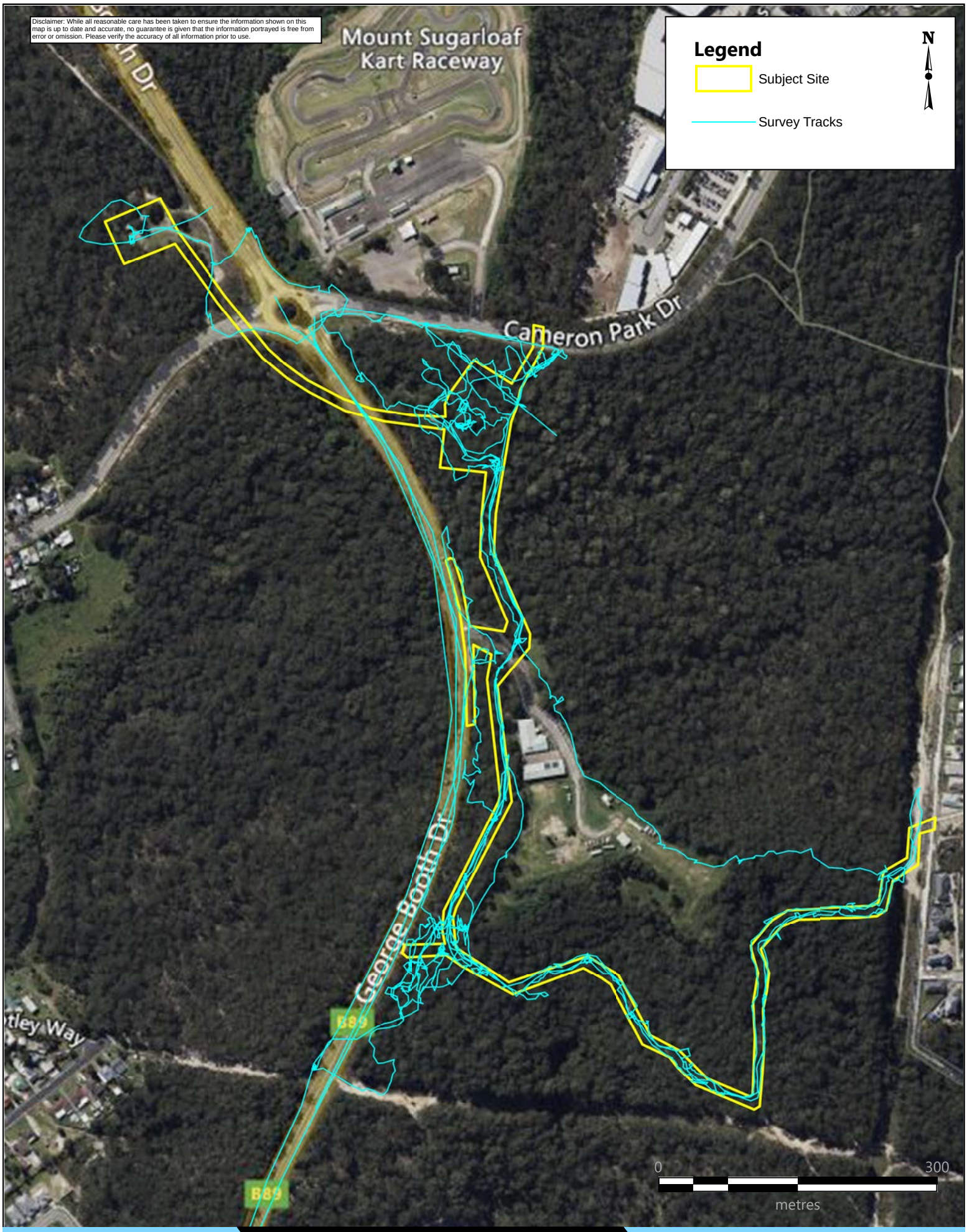
5.2.5 Details of Field Surveys

A summary of the survey effort is below in **Table 1** and **Figure 3**.

Table 1 – Survey Effort

Date	Time	Field Activity	No. of Persons on Site
30/08/2021	09:30- 14:30	• Flora Random Meander • Habitat Assessment • Incidentals • Bird Survey	2
14/10/2021	10:30 – 15:00	• Targeted Flora Survey • Habitat Tree Survey • Incidentals	1
1/11/2021	10:00 – 13:15	• Targeted Flora Survey • Habitat Tree Survey • Incidentals	1

In addition, by applying rigorous habitat assessment to more mobile species identified in BioNet Atlas records within the locality, it was ensured that all possible use of the Subject Site by notable species was considered, and accommodated within subsequent biodiversity assessment and management recommendations. Refer to **Figure 3** for survey effort results.



AEP

Title: Figure 3 - Survey Effort Map

Date: June 2022

Location: Cameron Park, NSW

Client: Hunter Water

AEP Ref: 2430

5.3 Vegetation Communities

Previous datasets consulted prior to fieldwork included those conducted by National Parks and Wildlife Service (NPWS) as part of the Lower Hunter Central Coast Regional Environmental Management Strategy (LHCCREMS) in 2000 and 2003 which is superseded by the more recent Lower Hunter Vegetation Mapping (Parsons Brinkerhoff, 2013).

The native vegetation present within the Subject Site was mapped by Parsons Brinkerhoff (2013) as containing PCT 1589 - Spotted Gum - Broad-leaved Mahogany - Grey Gum grass - shrub open forest on Coastal Lowlands of the Central Coast and PCT 1619 - Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands.

Fieldwork was conducted to ground-truth regional vegetation mapping. Ground-truthing of the vegetation revealed that the entire reservoir site is consistent with:

- PCT 1589 - Spotted Gum - Broad-leaved Mahogany - Grey Gum grass - shrub open forest on Coastal Lowlands of the Central Coast (refer **Plate 1** and **Figure 4**);
- while the northern part of the proposed alignment is commensurate with PCT 1589 - Spotted Gum - Broad-leaved Mahogany - Grey Gum grass - shrub open forest on Coastal Lowlands of the Central Coast;
- the reminder is commensurate with PCT 1619 - Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands (refer **Plate 2** and **Figure 4**).

Neither PCT is associated with an EEC under the *BC Act* or *EPBC Act*.

PCT 1598 consists of predominantly *Eucalyptus umbra* (Broad-leaved White Mahogany), *Eucalyptus capitellata* (Brown Stringybark), *Corymbia maculata* (Spotted Gum) *and Eucalyptus siderophloia* (Northern Grey Ironbark). The site has been previously cleared with the majority of canopy species less than 500mm (DBH).

Midstratum species include *Dodonaea triquetra* (Common hop bush)*, Acacia longifolia* (Golden wattle), *Persoonia linearis* (narrow-leaved geebung) *Acacia ulicifolia* (Prickly Moses) and *Daviesia ulicifolia* (Gorse Bitter Pea). Lantana is present throughout this stratum forming dense thickets in some areas.

The ground stratum consists of a mix of exotics and native species due to historical disturbance. Dominant native species include *Dianella caerulea var. producta* (Blue flax lily)*, Imperata cylindrica* (Blady grass)*, Themeda triandra* (Kangaroo grass), *Hibbertia scandens* (Snake vine) and *Lomandra confertifolia*. A moderate level of exotic species is present within the ground stratum, these include *Hyparrhenia hirta* (Coolatai grass), *Verbena bonariensis* (Purple Top) and *Sida rhombifolia* (Paddy's lucerne). Weed incursion is more dominant along road verges and access tracks where edge effects are amplified. Urban refuse is present on site in the form of construction debris and dumped household rubbish.

The current vegetation exists in a moderate condition and has good connectivity to the surrounding landscape.

Plate 1 – PCT 1589 - *Spotted Gum - Broad-leaved Mahogany - Grey Gum grass - shrub open forest on Coastal Lowlands of the Central Coast* within the Subject Site (reservoir site)

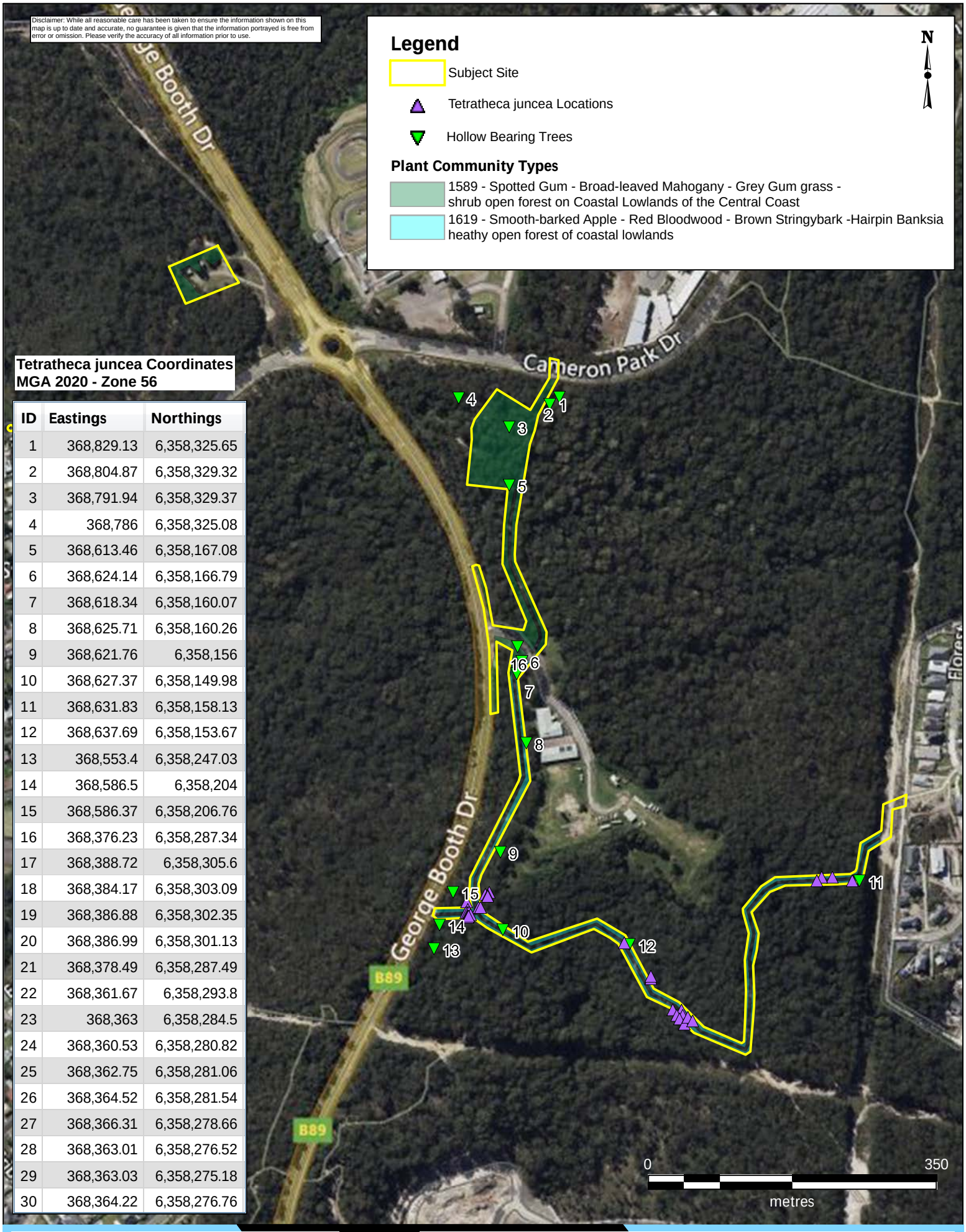
PCT 1619 consists of *Angophora costata* (Smooth-barked Apple), *Corymbia gummifera* (Red Bloodwood), *Corymbia maculata* (Spotted Gum) and *Eucalyptus capitellata* (Brown Stringybark).

Midstratum species include *Banksia spinulosa* (Hairpin Banksia), *Xanthorrhoea latifolia, Glochidion ferdinandi* (Cheese Tree), Allocasuarina littoralis (Black Sheoak) and *Doryanthes excelsa* (Gymea Lily).

The ground stratum species include *Themeda triandra* (Kangaroo Grass), *Dianella caerulea* (Blue Flax-lily), *Pimelea linifolia* (Slender Rice Flower), *Lomandra obliqua* (twisted mat-rush) and the threatened species *Tetratheca juncea* (Black-eyed Susan).

This vegetation exists in a high-quality state, with very minimal exotics present.

Plate 2 – PCT 1619 - *Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands* within the Subject Site (proposed alignment)



Tetratheca juncea Coordinates
MGA 2020 - Zone 56

ID	Eastings	Northings
1	368,829.13	6,358,325.65
2	368,804.87	6,358,329.32
3	368,791.94	6,358,329.37
4	368,786	6,358,325.08
5	368,613.46	6,358,167.08
6	368,624.14	6,358,166.79
7	368,618.34	6,358,160.07
8	368,625.71	6,358,160.26
9	368,621.76	6,358,156
10	368,627.37	6,358,149.98
11	368,631.83	6,358,158.13
12	368,637.69	6,358,153.67
13	368,553.4	6,358,247.03
14	368,586.5	6,358,204
15	368,586.37	6,358,206.76
16	368,376.23	6,358,287.34
17	368,388.72	6,358,305.6
18	368,384.17	6,358,303.09
19	368,386.88	6,358,302.35
20	368,386.99	6,358,301.13
21	368,378.49	6,358,287.49
22	368,361.67	6,358,293.8
23	368,363	6,358,284.5
24	368,360.53	6,358,280.82
25	368,362.75	6,358,281.06
26	368,364.52	6,358,281.54
27	368,366.31	6,358,278.66
28	368,363.01	6,358,276.52
29	368,363.03	6,358,275.18
30	368,364.22	6,358,276.76

AEP

Title: Figure 4 - Vegetation and Habitat Feature Map

Date: Aug 2022

Location: Cameron Park, NSW

Client: Hunter Water

AEP Ref: 2430

5.4 Flora

Flora surveys have resulted in the identification of sixty-nine (69) species of plants within the Subject Site. Of these flora species, twelve (12) are considered exotic. During the survey 29 clumps of *Tetratheca juncea (*Black-eyed Susan) a threatened species, listed as vulnerable under the *BC Act* and *EPBC Act,* were recorded.

A full list of flora species identified by surveys conducted within the site is included in **Appendix B**.

5.4.1 Exotic Species

Under the *Biosecurity Act, 2015*, all plants in NSW are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Twenty-nine (29) exotic species of plants have been identified within the Subject Site. Two of these species, *Senecio madagascariensis* (Fireweed) and *Lantana camara* (Lantana) are listed at the federal level as Weeds of National Significance (WoNS).

5.5 Habitat Assessment

- **Native vegetation** – The vegetation within the Subject Site consists of native eucalypts within the canopy. Mid-stratum is dominated by natives with some exotics present. The ground layer indicates varying levels of disturbance with natives present.
- **Hollow-bearing trees** – There were sixteen (16) hollow- bearing trees recorded during site surveys, nine (9) within the Subject Site which will be impacted by the proposal and seven (7) outside the Subject Site boundary that will be retained. Hollows present fall into the 'small' and 'medium' category with one 'large'. These may be suitable for a range of species of arboreal mammals, birds and microbats. Details of the HBT survey is provided in **Table 2** below. Hollow-bearing trees are presented in **Figure 4.**
- **Water features** – There are no water features occurring within the Subject Site
- **Other habitat features** –The understorey may be suitable for a variety of terrestrial fauna species. There are also log piles and piles of refuse which may provide habitat for reptiles. Along with the HBTs a number of other trees were identified as containing a variety of habitat features that may be utilised by resident fauna, this included decorticating bark, fissures within trunks and branches and a number of dead wood/ branches that may provide resources for resident fauna.
- **Patch size / connectivity** –Vegetation present in the form of canopy trees, midstratum and lower stratum is well connected to the surrounding landscape in all directions although roads may limit mobility for some species.

Table 2 - Hollow-bearing Tree Survey

HBT	Species	Small	Med.	Large	XL	DBH (mm)
001	Stringybark	1				600
002	Ironbark		1			1000
003	Stag	2	1			400
004	Stringybark	1				700
005	Stringybark	1				500
006	*Angophora costata*	3				700
007	Stringybark	1	1			600
008	Stringybark	1				500
009	*Angophora costata*	2	1	1		900
010	Stringybark	1				600
011	*Corymbia maculata*	1				600
012	Stringybark		1			600
013	Stringybark	2				
014	Stringybark	2				
015	Stringybark	2				
016	Stringybark	1				
Total		**21**	**5**	**1**	**0**	
Total		**27**				

5.6 Fauna

Fauna surveys undertaken have identified twenty-six (26) species within the Subject Site, including one (1) mammal, twenty-four (24) birds and one (1) reptile. The site provides moderate and high-quality habitat for a range of different species.

A list of fauna species present onsite has been generated for the site and is included within the Expected Fauna List in **Appendix C**.

5.7 Database Searches

Searches were undertaken of databases within a 10km radius of the Subject Site for BC Act listings and 5km radius for EPBC Act listings. Note that any records considered erroneous, historic only, or obviously of no relevance to the site in regards to habitat (e.g., seabirds, marine species etc.) were omitted.

The potential for listed threatened species to occur within the site is considered in **Table 3** below.

Table 3 – Threatened Species Appraisal

Scientific Name	Common Name	NSW status	Comm. status	Likelihood of Occurrence
Aves				
Ptilinopus magnificus (1)	Wompoo Fruit-Dove	V		Only one record of this species exists within the locality. This species was not observed during surveys. The area to be cleared does not contain suitable rainforest habitat. This species is unlikely to be significantly impacted by the proposed activity.
Hirundapus caudacutus (9)	White-throated Needletail		V	This species was not observed during surveys. Given the broad range of potential habitats and the small footprint of the activity, this species is unlikely to be significantly impacted.
Ephippiorhynchus asiaticus (1)	Black-necked Stork	V		Only one record of this species exists within the locality. This species was not observed during surveys. The area to be cleared does not contain suitable wetland habitat. This species is unlikely to be significantly impacted by the proposed activity.
Ixobrychus flavicollis (1)	Black Bittern	V		Only one record of this species exists within the locality. This species was not observed during surveys. The area to be cleared does not contain suitable estuarine/riparian habitat. This species is unlikely to be significantly impacted by the proposed activity.
Haliaeetus leucogaster (15)	White-bellied Sea-Eagle	V		This species was not recorded during surveys. White-bellied Sea-Eagle continue to use the same nest tree year after year. No nesting trees were found to be on site. It is unlikely that the proposed activity will impact this species.
Hieraaetus morphnoides (2)	Little Eagle	V		This species was not recorded during surveys. No nesting trees were found to be on site. It is unlikely that the proposed activity will significantly impact this species.
Pandion cristatus (2)	Eastern Osprey	V		This species was not recorded during surveys. Osprey continue to use the same nest tree year after year. No nesting trees were found to be on site. It is unlikely that the proposed activity will impact this species.

Scientific Name	Common Name	NSW status	Comm. status	Likelihood of Occurrence
Callocephalon fimbriatum (1)	Gang-gang Cockatoo	V		This species was not observed during surveys. BioNet contains one record of this species in the locality. While, the Subject Site does contain a small number of hollows that are potentially suitable, the species is not known from the locality and as such is considered unlikely to breed at this location. It is unlikely that the activity will impact this species.
Calyptorhynchus lathami (3)	Glossy Black-Cockatoo	V		This species was not observed during surveys. While, the Subject Site does contain a small number of hollows that are potentially suitable, the species is not known to be resident in the locality and as such is considered unlikely to breed at this location. The site does contain a very small amount of potential foraging habitat (*Allocasuarina sp*). Given the small activity footprint and the adjacent retained vegetation and offset lands providing suitable habitat, it is unlikely that the activity will impact this species.
Glossopsitta pusilla (18)	Little Lorikeet	V		This species was not observed during surveys. The site does contain preferred foraging habitat, however, given the small activity footprint and the adjacent retained vegetation and offset lands providing suitable habitat, it is unlikely that the activity will impact this species.
Lathamus discolor (3)	Swift Parrot	E	CE	The Subject Site is not mapped as an important area. This species was not observed during surveys. The site does contain preferred foraging habitat, however, given the small activity footprint and the adjacent retained vegetation and offset lands providing suitable habitat, it is unlikely that the activity will impact this species.
Ninox connivens (1)	Barking Owl	V		This species was not observed during surveys. BioNet contains one record of this species within the locality. The site does not contain suitable breeding habitat; however, the site does contain potential foraging habitat. Given the small activity footprint and the adjacent retained vegetation and offset lands providing suitable habitat, it is unlikely that the activity will impact this species.
Ninox strenua (36)	Powerful Owl	V		This species was not observed during surveys. The site does not contain suitable breeding habitat; however, the site does contain potential foraging habitat. Given the small activity footprint and the adjacent retained vegetation

Scientific Name	Common Name	NSW status	Comm. status	Likelihood of Occurrence
				and offset lands providing suitable habitat, it is unlikely that the activity will impact this species.
Tyto novaehollandiae (24)	Masked Owl	V		This species was not observed during surveys. The site does not contain suitable roosting or breeding habitat; however, the site does contain potential foraging habitat. Given the small activity footprint and the adjacent retained vegetation and offset lands providing suitable habitat, it is unlikely that the activity will impact this species.
Tyto tenebricosa (6)	Sooty Owl	V		This species was not observed during surveys. The site does not contain suitable roosting or breeding habitat; however, the site does contain potential foraging habitat. Given the small activity footprint and the adjacent retained vegetation and offset lands providing suitable habitat, it is unlikely that the activity will impact this species.
Climacteris picumnus victoriae (2)	Brown Treecreeper (eastern subspecies)	V		This species was not observed during surveys. Given the broad range of potential habitats and the small footprint of the activity, this species is unlikely to be significantly impacted by the proposed activity.
Chthonicola sagittata (2)	Speckled Warbler	V		This species was not observed during surveys. Given the broad range of potential habitats and the small footprint of the activity, this species is unlikely to be significantly impacted by the proposed activity.
Anthochaera phrygia (1)	Regent Honeyeater	E	CE	The Subject Site is not mapped as an important area. This species was not observed during surveys. The site does contain preferred foraging habitat, however, given the small activity footprint and the adjacent retained vegetation and offset lands providing suitable habitat, it is unlikely that the activity will impact this species.
Epthianura albifrons (3)	White-fronted Chat	V		This species was not observed during surveys. Given the broad range of potential habitats and the small footprint of the activity, this species is unlikely to be significantly impacted by the proposed activity.

Scientific Name	Common Name	NSW status	Comm. status	Likelihood of Occurrence
Melithreptus gularis Albi frons (2)	Black-chinned Honeyeater (eastern subspecies)	V		This species was not observed during surveys. Given the broad range of potential habitats and the small footprint of the activity, this species is unlikely to be significantly impacted by the proposed activity.
Pomatostomus temporalis Albi frons (2)	Grey-crowned Babbler (eastern subspecies)	V		This species was not observed during surveys. Given the broad range of potential habitats and the small footprint of the activity, this species is unlikely to be significantly impacted by the proposed activity.
Daphoenositta chrysoptera (10)	Varied Sittella	V		This species was not observed during surveys. Given the broad range of potential habitats and the small footprint of the activity, this species is unlikely to be significantly impacted by the proposed activity.
Artamus cyanopterus Albi frons (1)	Dusky Woodswallow	V		This species was not observed during surveys. Given the broad range of potential habitats and the small footprint of the activity, this species is unlikely to be significantly impacted by the proposed activity.
Melanodryas cucullata cucullate (1)	Hooded Robin (south-eastern form)	V		This species was not observed during surveys. Given the broad range of potential habitats and the small footprint of the activity, this species is unlikely to be significantly impacted by the proposed activity.
Petroica boodang (5)	Scarlet Robin	V		This species was not observed during surveys. Given the broad range of potential habitats and the small footprint of the activity, this species is unlikely to be significantly impacted by the proposed activity.
Mammals				
Dasyurus maculatus (2)	Spotted-tailed Quoll	V	E	No sign of the species was observed during field surveys. Given the good connectivity with adjacent vegetation, the highly mobile nature of this species and the small area of vegetation proposed for removal it is unlikely to be significantly impacted by the proposed activity.

Scientific Name	Common Name	NSW status	Comm. status	Likelihood of Occurrence
Phascolarctos cinereus (22)	**Koala**	V	V	No sign of the species was observed during field surveys. Feed trees for the species exist on site. Considering the highly mobile nature of this species and suitable habitat identified on site is it considered to be a subject species. **SUBJECT SPECIES**
Petaurus australis (7)	**Yellow-bellied Glider**	V		No sign of the species was observed during field surveys. There are suitable hollows for this species onsite. Considering the highly mobile nature of this species and suitable habitat identified on site is it considered to be a subject species. **SUBJECT SPECIES**
Petaurus norfolcensis (40)	**Squirrel Glider**	V		This species was not observed during field surveys. There are suitable hollows for this species onsite. Considering the highly mobile nature of this species and suitable habitat identified on site is it considered to be a subject species. **SUBJECT SPECIES**
Petauroides Volans (1)	Greater Glider		V	No sign of the species was observed during field surveys and only a single record from the locality. Given the broad range of potential habitats and the small footprint of the activity, this species is unlikely to be significantly impacted by the proposed activity.
Pteropus poliocephalus (18)	Grey-headed Flying-fox	V	V	This species was not observed during field surveys. No roosts were found to be present on site. This species may utilise the site for foraging. Given the small size of the proposed activity and the surrounding suitable foraging habitat, significant impacts to this species are considered unlikely.
Saccolaimus flaviventris (2)	**Yellow-bellied Sheathtail-bat**	V		There were a number of suitable hollows surveyed on site that could be potential habitat for the species. However, given the small size of the proposed activity and the surrounding suitable habitat, significant impacts to this species are considered unlikely. However, considering the highly mobile nature of this

Scientific Name	Common Name	NSW status	Comm. status	Likelihood of Occurrence
				species and suitable habitat identified on site is it considered to be a subject species. **SUBJECT SPECIES**
Micronomus norfolkensis (3)	**Eastern Coastal Free-tailed Bat**	V		There were a number of suitable hollows surveyed on site that could be potential habitat for the species. However, given the small size of the proposed activity and the surrounding suitable habitat, significant impacts to this species are considered unlikely. However, considering the highly mobile nature of this species and suitable habitat identified on site is it considered to be a subject species. **SUBJECT SPECIES**
Chalinolobus dwyeri (12)	Large-eared Pied Bat	V	V	There was no suitable roosting habitat surveyed for this species on site. Given the small size of the proposed activity and the surrounding suitable foraging habitat, significant impacts to this species are considered unlikely.
Falsistrellus tasmaniensis (3)	Eastern False Pipistrelle	V		There were a number of suitable hollows surveyed on site that could be potential habitat for the species. However, given the small size of the proposed activity and the surrounding suitable habitat, significant impacts to this species are considered unlikely. However, considering the highly mobile nature of this species and suitable habitat identified on site is it considered to be a subject species. **SUBJECT SPECIES**
Myotis macropus (2)	Southern Myotis	V		There was no suitable habitat surveyed for this species on site. It is unlikely to occur within the Subject Site.
Scoteanax rueppellii (4)	**Greater Broad-nosed Bat**	V		There were a number of suitable hollows surveyed on site that could be potential habitat for the species. However, given the small size of the proposed activity and the surrounding suitable habitat, significant impacts to this species are considered unlikely. However, considering the highly mobile nature of this species and suitable habitat identified on site is it considered to be a subject species. **SUBJECT SPECIES**

Scientific Name	Common Name	NSW status	Comm. status	Likelihood of Occurrence
Vespadelus troughtoni (1)	Eastern Cave Bat	V		There was no suitable roosting habitat surveyed for this species on site. Given the small size of the proposed activity and the surrounding suitable foraging habitat, significant impacts to this species are considered unlikely.
Miniopterus australis (12)	**Little Bent-winged Bat**	V		There were a number of suitable hollows surveyed on site that could be potential habitat for the species. However, given the small size of the proposed activity and the surrounding suitable habitat, significant impacts to this species are considered unlikely. However, considering the highly mobile nature of this species and suitable habitat identified on site further assessment is afforded herein. **SUBJECT SPECIES**
Miniopterus orianae oceanensis (2)	Large Bent-winged Bat	V		This species was not observed during field surveys. No roosts were found to be present on site. This species may utilise the site for foraging. Given the small size of the proposed activity and the surrounding suitable foraging habitat, significant impacts to this species are considered unlikely.
Flora				
Rutidosis heterogama (6)	Heath Wrinklewort	V	V	The species was not recorded during targeted survey of the subject site. It is considered to be absent and is therefore unimpacted by the proposed activity.
Tetratheca juncea (660)	**Black-eyed Susan**	V	V	29 clumps of the species were identified during the recent survey which were conducted during peak flowering season. **SUBJECT SPECIES**
Angophora inopina (613)	Charmhaven Apple	V	V	The species was not recorded during targeted survey of the subject site. It is considered to be absent and is therefore unimpacted by the proposed activity.
Callistemon linearifolius (142)	Netted Bottle Brush	V		The species was not recorded during targeted survey of the subject site. It is considered to be absent and is therefore unimpacted by the proposed activity.
Rhodamnia rubescens (8)	Scrub Turpentine	E		The species was not recorded during targeted survey of the subject site. It is considered to be absent and is therefore unimpacted by the proposed activity.

Scientific Name	Common Name	NSW status	Comm. status	Likelihood of Occurrence
Syzygium paniculatum (1)	Magenta Lilly Pilly	E	V	This species was not recorded during surveys. The habitat present is considered unsuitable for this species. This species will not be impacted by the proposed activity.
Cymbidium canaliculatum (1)	Cymbidium canaliculatum population in the Hunter Catchment	E		The species was not recorded during targeted survey of the subject site. It is considered to be absent and is therefore unimpacted by the proposed activity.
Grevillea parviflora subsp. Parviflora (51)	Small-flower Grevillea	V	V	The species was not recorded during targeted survey of the subject site. It is considered to be absent and is therefore unimpacted by the proposed activity.

6.0 Key Species Considerations

The species identified for further consideration have been categorised into guilds (refer **Table 4**). By considering these species and their lifecycle needs, many other species are also inadvertently considered. The analysis below considers key lifecycle features for each guild of species in more detail, and assists in informing the subsequent 5-part test assessment.

Table 4 – Key Species Analysis

Guild / Species	Key Habitat Feature	Comment
Koala	Foraging	Suitable feed trees for the species identified on site. Although the species was not identified during field surveys, habitat exists for the species and it will be addressed in the 5-part test.
Gliders	Foraging / Breeding	Suitable nesting/breeding hollows and foraging habitat was identified on site. Although the species was not identified during field surveys, a precautionary approach has been adopted and presence of these species has been assumed on site and will be addressed in the 5-part test.
Microbats	Foraging / Roosting and potential breeding habitat	Suitable roosting /breeding hollows and foraging habitat was identified on site. The precautionary approach has been adopted and presence of these species has been assumed on site and will be addressed in the 5-part test.
Tetratheca juncea	Distribution	The site contains suitable habitat for the species and 29 clumps here identified during site surveys, fourteen (14) clumps were identified within the Subject Site and will be impacted by the proposal. Presence is concentrated along the side of the track within the proposed watermain alignment and is assumed to occupy suitable habitat on adjacent lands.

7.0 5-Part Test Assessment

Section 7.3 of the BC Act lists five factors that must be taken into account in determining the significance of potential impacts of proposed activities on threatened species, populations, ecological communities and/or their habitats as listed within the BC Act.

The 5-part test is used to determine whether there is likely to be a significant impact from the proposed activity.

It is proposed to impact 1.32ha of PCT 1589 - *Spotted Gum - Broad-leaved Mahogany - Grey Gum grass - shrub open forest on Coastal Lowlands of the Central Coast* and 0.93ha of PCT 1619 - Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands. Of this 0.96ha of PCT 1589 will be removed permanently while 0.36ha will be rehabilitated and the total 0.93ha of PCT 1619 will be rehabilitated. Sixteen (16) Hollow Bearing trees were identified during field surveys nine (9) of these will be removed while (7) will be retained.

a) in the case of a threatened species, whether the proposed development or activity 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

The site has good landscape connectivity with adjacent vegetation in all directions and is suitable for mobile species such as arboreal mammals (Koala and Gliders) that require the presence of canopy to move through the landscape. The Subject Site contains nine (9) HBTs, providing roosting habitat for species such as small mammals, birds and microbats. 2.25ha of native vegetation will be impacted by the proposal. Given the linear and narrow nature of the activity It is not anticipated that the removal of native vegetation is going to increase fragmentation within the area. Any native fauna utilising the Subject Site will have the opportunity to move into the wider landscape surrounding the site.

Tetratheca juncea:

Tetratheca juncea (Black-eyed Susan) was identified during targeted surveys conducted within the peak flowering period. The quantitative survey identified twenty-nine (29) clumps in total, fourteen (14) within the Subject Site and fifteen (15) outside the site boundary. A clump is defined as a group of plants not separated by more than 30cm. *T. juncea* has been observed growing in vegetated areas at the track edges, fifteen (15) will be retained while the fourteen (14) within the Subject Site will be impacted by the proposal. See **Figure 4**.

The part of the proposal that will impact *T. juncea* will be the water main alignment that will wind through PCT 1619 - *Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands.* Works will predominantly be concentrated within the established fire trail although 0.93ha of vegetation along the track edges will be initially impacted but rehabilitation post construction will be undertaken.

This highly suitable habitat for the species exists in a high-quality state and encompasses large areas within adjacent lands indicating the likely presence of additional plant clumps within the immediate vicinity as well as the wider locality indicated by 660 Bionet Atlas records within the 10km x 10km radius of the Subject Site. The proposal is of a narrow linear nature so will not fragment the landscape nor disconnect the population in any way as to hinder dispersal of seed and genetic material or hinder pollinators or their dispersal ability. The Subject Site and surrounds exist as an offset area (C2) that will likely provide good opportunities for the long-term conservation of this population.

Lake Macquarie Tetratheca juncea Planning and Management Guidelines suggest the removal of 25% of a viable population would constitute a significant impact. While the proposed activity will remove or

disturb approx. 50% of the clumps identified within the subject site, it is known more widely within the locality including from Bionet records, as such the activity will not remove 25% of the local population. Given the relative abundance of the species within the site, abundance of suitable habitat in adjacent lands and likely abundance of individuals therein, it is not considered that removal of 14 individuals will significantly impact the lifecycle of the species nor place this population at risk of extinction.

Koala:

The Subject Site and contains several koala feed trees that are listed in the Koala Habitat Protection SEPP 2021. As well as this Bionet contains 22 records for Koala with a 10km radius of the Subject Site. Of these 22 records 18 exist to the west of the M1 Pacific Motorway, with the M1 acting as a significant barrier to Koala dispersal within the region. Koalas appear to recognise major features such as highways as boundaries to their home ranges, and have been found to seldom cross them (Lassau et al. 2008).

Habitat assessment, general searches for koala presence and vegetation mapping were undertaken in October 2021. No scats, scratchmaks or other signs of Koalas were found within the Subject Site. Given the small size of the site, it is considered unlikely that current Koala population within the site would go undetected. Furthermore, given the small area of moderate quality habitat to be removed and considering the availability of suitable foraging and breeding habitat in the broader locality it is not anticipated that the removal of a small of native vegetation will significantly impact this species.

Microbats:

For cave dwelling species, namely Eastern Bent-wing Bat the site is foraging habitat only. Foraging habitat will remain on adjacent lands post works. These species will not be significantly impacted by the proposed activity.

For hollow dwelling species there is some potential for individuals to be impacted upon by clearing of hollows within the Subject Site, however, it is unlikely the removal these HBTs will significantly impact any local population. Particularly, given the numerous hollow bearing trees in adjacent lands and abundance of woodland/open forest and grassland ecotonal habitat in the locality.

As some species of microbat roost and breed in tree hollows, it is considered an important safeguard measure that pre-clearance surveys of hollow trees are carried out, and that a supervising ecologist is on hand during all clearing works to rescue any potentially affected native fauna. Installation of nest boxes as compensatory habitat would also minimise the impact of hollow-bearing tree removal upon resident species.

Gliders:

While neither Squirrel Glider nor Yellow-bellied Glider were observed during the current assessment, there are numerous records of Squirrel Glider and Yellow-bellied Glider from the locality and as such presence is assumed. While a small number of hollows will be removed by the proposal, given the relative abundance of suitable habitat within the wider locality, it is considered unlikely that either species will be significantly impacted upon by the proposal.

Given that the gliders roost/den in tree hollows, it is considered an important safeguard measure that pre-clearance surveys of hollow trees are carried out within areas proposed to be cleared, and that a supervising ecologist is on hand during clearing to rescue any potentially affected native fauna. Installation of nest boxes as compensatory habitat would also minimise the impact of hollow-bearing tree removal upon resident species.

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b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

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

Neither PCT 1589 or 1619 is associated with any known Endangered Ecological Communities (EEC).

c) in relation to the habitat of a threatened species or ecological community:

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

The vegetation to be directly impacted by the proposal will remove approximately 2.25ha of native vegetation. There were nine (9) HBTs identified within the Subject Site which may be impacted as a result of the proposal. If removed these hollows will be salvaged and replaced back in the landscape for terrestrial fauna as part of the compensatory actions.

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

The removal of vegetation by the proposal will not increase fragmentation in the area, nor will it impact on connectivity for fauna utilising the site and surrounding landscape.

iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality

The vegetation to be directly impacted by the proposal does not provide significant habitat for the threatened species potentially occurring within the Subject Site. It is of a low importance to the long-term survival of the any potentially occurring threatened species. This limited habitat is therefore not considered important to the survival of any threatened species or ecological communities in the locality.

d) Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly)

The proposed activity will not directly or indirectly impact areas of outstanding biodiversity value as the footprint for activity is outside the biodiversity value protection zone.

e) Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process (KTP)

The activity has potential to contribute to the following KTPs:

- ***Anthropogenic climate change***

The proposal will contribute in a small way to the processes causing Anthropogenic Climate Change via the removal of vegetation which acts as a carbon sink. However, due to the small area to be impacted it is considered an insignificant contribution to this KTP.

- ***Clearing of native vegetation***

The proposal will involve the removal of 2.25ha of native vegetation, this removal is not considered to contribute to this KTP in any notable magnitude.

- ***Invasion and establishment of aggressive weed species and exotic perennial grasses***

There is potential for an increase in weed species and exotic grasses to encroach on the reserve adjacent to the Subject Site due to edge effects, however the site is already experiencing the edge effects of weed encroachment. Therefore, a drastic increase is not expected to occur and the level of impacts to remaining biodiversity values are considered minimal.

- ***Infection of native plants by Phytophthora cinnamomic***

There is potential for the activity to contribute to this KTP during the clearing and construction phase. Appropriate hygiene protocols are outlined in **Section 11** If such controls are implemented, the risk for the proposal to contribute to this KTP will be minimised.

- ***Introduction and establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae***

There is potential for the proposal to contribute to this KTP during the clearing and construction phase. Appropriate hygiene protocols are outlined within **Section 11**. If such controls are implemented, the risk for the activity to contribute to this KTP will be minimised.

8.0 Environmental Offset Requirements

The proposal is planned to occur within lands that have been established as an offset site. The offset land is proposed to be dedicated to Council by Hammersmith Management Pty Ltd following the 10-year maintenance period in accordance with a Voluntary Planning Agreement (VPA).

The proposal will directly impact Lot 2 DP 1156170 and Lot 2999 DP 1260247 of the offset lands as follows:

- 0.33ha of PCT 1589 which exists in a moderate condition will be permanently cleared;
- 0.05ha of PCT 1589 which exists in a moderate condition will be cleared and then rehabilitated; and
- 0.33ha of PCT 1619 which exists in a high-quality state will be cleared and then rehabilitated.

Along with the direct impacts from the proposal indirect impacts must be taken into consideration and will likely include:

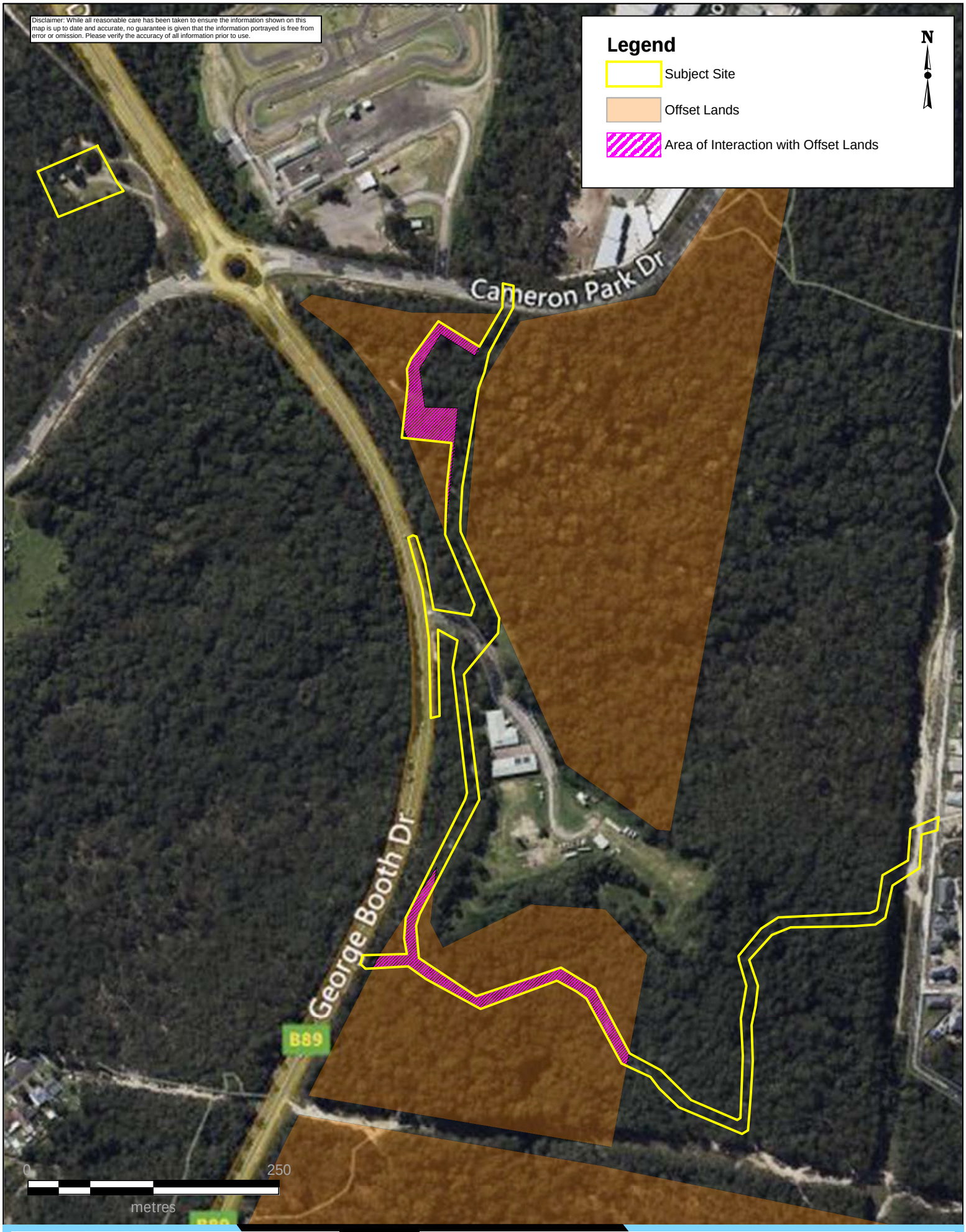
- Edge effects;
- Erosion;
- Impacts sediment yield.

See **Figure 5** for the interaction between the offset lands and the proposal and **Figure 6** for impacts to native vegetation within the offset lands.

8.1 Recommendations

To compensate for impacts upon native vegetation within the offset lands a land based offset approach is recommended, where by 0.71ha of land is incorporated into the existing offset lands to offset the 0.71ha hectares that are planned to be permanently cleared and/ or disturbed.

- Cleared and disturbed offset land is compensated for and rehabilitated;
- Native vegetation rehabilitation should aim for a self-maintaining state;
- The quantum and quality of the native vegetation offset on the proposed offset land remains the same as agreed with Hammersmith and within the intention of the Planning Agreement (i.e., offset the disturbed offset lands); and
- The management plan for the offset site will need to be updated to incorporate any variations to the offset land and to deal with any changes management costs and increased edge impacts.



AEP

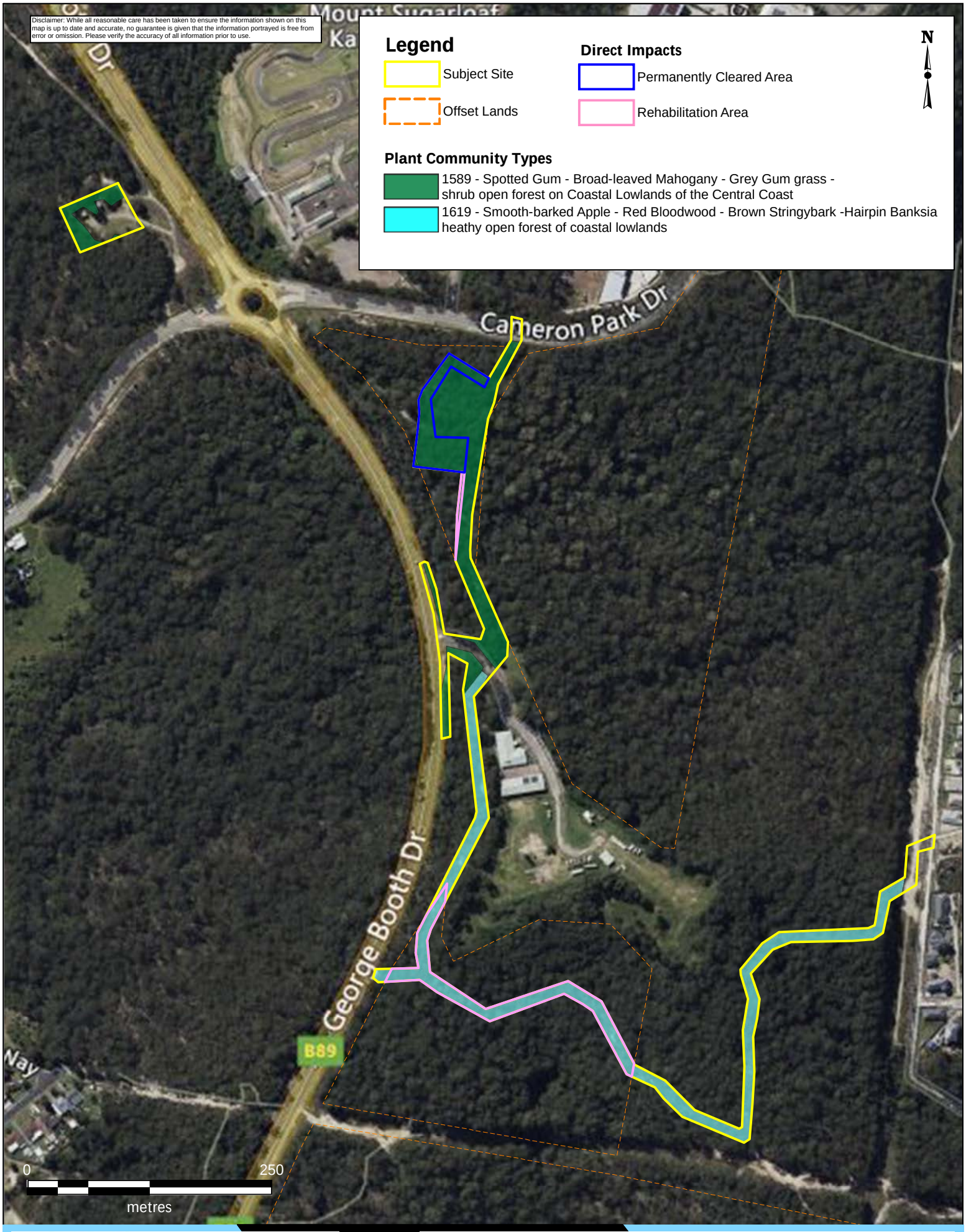
Title: Figure 5 - Offset Lands Map

Date: Aug 2022

Location: Cameron Park, NSW

Client: Hunter Water

AEP Ref: 2430



AEP

Title: Figure 6 - Offset Impact Map

Date: Aug 2022

Location: Cameron Park, NSW

Client: Hunter Water

AEP Ref: 2430

9.0 EPBC Act Assessment

A search was conducted in June 2022 of MNES as relevant to the *Environment Protection & Biodiversity Conservation Act 1999* (EPBC Act). The following MNES are considered in this 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 Place and does not contain any matters of national heritage.

Wetlands of International Significance (declared Ramsar wetlands):

The site is proximate to Hunter Estuary Wetlands which is of international significance. It is not anticipated that this activity will have an impact on this wetland.

Great Barrier Reef Marine Park:

The site is not part of, or within close proximity to, the Great Barrier Reef Marine Park.

Commonwealth Marine Areas:

The site is not part of, or within close proximity to, any Commonwealth Marine Area.

Threatened Ecological Communities:

The following Threatened Ecological Communities (TEC) have been identified as occurring within 5km of the Subject Site:

- *Central Hunter Valley eucalypt forest and woodland;*
- *Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community; and*
- *River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria.*

No TEC's were identified within the Subject Site.

Threatened Species:

The EPBC Act listed *Tetratheca juncea* (black-eyed susan) was identified during targeted surveys conducted within the peak flowering period. The quantitative survey identified twenty-nine (29) clumps in total, fourteen (14) within the Subject Site and fifteen (15) outside the site boundary. A clump is defined as a group of plants not separated by more than 30cm. *T. juncea* has been observed growing in vegetated areas at the track edges, fifteen (15) will be retained while the fourteen (14) within the Subject Site will be impacted by the proposal. See **Figure 4**.

To determine if a EPBC referral is required we have undertaken the following assessment to reach our recommendation:

Could your action impact on an important population of black-eyed susan?

1. has greater than 1000 plant clumps (see glossary)? Unknown.
2. an area of habitat has an average estimated plant clump density of 20 clumps/hectare or greater? Within the Subject Site no, but wider area unknown.
3. occurs in rare habitat (see section 3)? No.
4. occurs in an area of "important habitat" as defined in Maps 4a 4 and 4b and has greater than 500 plant clumps? No.
5. occurs at or near the distributional limits of black-eyed susan (Maps 1 to 3)? No.
6. occurs in close proximity to a protected area (e.g., National Park) where black-eyed susan is known to occur? No, although the C2 offset lands may constitute a protected area.

***Tetratheca juncea* individuals within the Subject Site may form part of an important population.**

Could your action require a referral to the federal environment minister for significant impacts on the black-eyed susan?

A high risk of a significant impact will occur if a proposed action will directly or indirectly affect an important population of black-eyed susan, resulting in:

- loss of greater than 25% or 1000 plant clumps (whichever is the lesser) within the affected area?

  No. Given the suitable contiguous habitat that exists on adjacent lands and high number of Bionet Atlas records in the immediate vicinity it is highly likely that additional plant clumps exist within the immediate vicinity and within this population and that 14 individuals do not represent a loss of 25% of the population.

- fragmentation of a subpopulation (see glossary) that results in:

  - subpopulations greater than 500 m apart within native vegetation; or
  - subpopulations greater than 100 m apart within degraded/developed habitat or non-native vegetation;

  No. The proposal will not result in any fragmentation of any subpopulation.

- reduction in native vegetation corridor width, connecting subpopulations, to less than 20 m;

  No. The proposal will not result a reduction of any vegetation corridor.

- reduction of greater than 10% in the number of flowering plants (any species) within the affected area.

  No.

The proposal is <u>not at a high risk</u> of significantly impacting *Tetratheca juncea.*

- uncertainty about significant impacts on black-eyed susan may exist where actions, although not directly affecting black-eyed susan, may have the potential for indirect impacts such as, but

not limited to: affecting pollinators or their dispersal ability, altering flowering plant diversity, altering hydrology, or introducing non-indigenous species or disease such as the plant pathogen Phytophthora cinnamomi;

No. If mitigation measures are implemented indirect impacts can be managed.

- any degradation of suitable habitat within a 30 m buffer extending from the edge of an important population surveyed in accordance with this document.

  Yes. Impacts to *Tetratheca juncea* are proposed.

As impacts to *Tetratheca juncea are proposed there is uncertainty as to whether a referral is required. A referral or contact with the department is therefore recommended for legal clarity.*

Migratory Species:

A number of EPBC listed migratory species have potential to utilise the site on an irregular basis. The limited number and sporadic nature of records close to the Subject Site appear to reflect opportunistic rather than regular use of any habitat considered of importance to any threatened species.

It is not considered that the activity of this land as proposed is likely to significantly affect the availability of potential habitat for such mobile species, or disrupt migratory patterns.

EPBC Act Assessment Conclusion:

The only MNES to be impacted upon will be *Tetratheca juncea* and as such an EPBC referral for the impact of *Tetratheca juncea* is recommended as there is uncertainty as to whether a referral is required. A referral or contact with the department is recommended for legal clarity. No other MNES (specifically in this instance threatened species, threatened ecological communities or listed migratory species) are expected to be impacted upon significantly as a result of the proposal.

10.0 Mitigation Measures

This ecological assessment has taken into account the avoid, minimise/mitigate and offset approach. General recommendations are made for consideration to mitigate potential impacts on local biodiversity as a result of the activity of the site

- The disturbance footprint for the proposed watermain alignment will be kept to a minimum by limiting access and works to the existing trail as far as practicable. Where possible, equipment and vehicles will remain on existing tracks. The pipeline pathway has been designed to minimise impacts on threatened species, and methods such as hand excavation around trees to be retained should adopted to maximise hollow-bearing tree retention. If any significant trees (habitat and mature trees) are to be removed or their root zones likely to be impacted, an arborist will be present to supervise and advise on construction work near those trees.
- Spoil from excavation is to be stockpiled within the existing tracks to avoid impacts to native vegetation. These areas are to identified during the Construction Environmental Management Plan (CEMP).
- A flora and fauna management plan will be prepared as part of the CEMP.
- Given the cryptic nature of *Tetratheca juncea* outside of the flowering period, plant clumps in close proximity to the disturbance area will be identified with flagging tape by the supervising ecologist prior to works to clearly delineate retained plant clumps. Clumps will then be fenced as 'no go' areas to prevent construction encroachment.
- Required clearing of any vegetation on site should be undertaken in the presence of a suitably experienced ecologist to ensure any displaced native fauna can be taken into care and dealt with appropriately.
- Pre-clearance surveys should be undertaken to identify and clearly mark all habitat features including hollow-bearing trees, and observe any occupied hollows prior to felling. Appropriate measures should be devised prior to vegetation removal works to minimise impacts on resident fauna during the felling process;
- Felled trees should remain in situ a minimum of 48 hours to allow any fauna to disperse to retained vegetation to the north and south;
- To mitigate the potential loss of any hollow bearing trees nest boxes are to be installed in retained and adjacent vegetation. Hollows are to be remedied with a 1:1 ratio of replacement. Where possible removed hollows will be salvaged and utilised as nestboxes;
- Impacts of Chytrid and Phytophthora will be managed through the adoption of site hygiene protocols;
- Workers, equipment and vehicles are to remain within the construction zone as far as practicable and avoid entering surrounding vegetated areas. Site induction procedures will include explanation of Phytophthora and its impacts. Further, fauna handling, including of amphibians, is to be undertaken only by a qualified ecologist or wildlife carer;
- Rehabilitation should focus on stable landform shaping to facilitate regeneration of native species occurring on site where natural areas are disturbed. No exotic species are to be introduced to site with the exception of sterile cover crops (if appropriate).

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Appendix A – Flora Species List

FLORA SPECIES LIST

The following list includes all species of vascular plants observed on site during fieldwork. It should be noted that such a list cannot be considered comprehensive, but rather indicative of the flora present on the site. It can take many years of flora surveys to record all of the plant species occurring within any area, especially plant species that are only apparent in some seasons such as Orchids.

A number of species cannot always be accurately identified during a brief survey, generally due to a lack of suitable flowering and/or fruiting material. Any such species are identified as accurately as possible, and are indicated in the list as thus:

- specimens that could only be identified to genus level are indicated by the generic name followed by the abbreviation “sp.”, indicating an unidentified species of that genus;
- specimens for which identification of the genus was uncertain are indicated by a question mark (“?”) placed in front of the generic, which is followed by the abbreviation “sp.” and;
- specimens that could be accurately identified to genus level, but could be identified to species level with only a degree of certainty are indicated by a (“?”) placed in front of the epithet.

Authorities for the scientific names are not provided in the list. These follow the references outlined below.

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Names of families and higher taxa follow a modified Cronquist System (1981).

Introduced species are indicated by an asterisk “*”.

Threatened species listed under the *Biodiversity Conservation Act 2016* (BC Act) or the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) are indicated in **bold font.**

Family	Scientific Name	Common Name
Adiantaceae	*Adiantum aethiopicum*	Common Maidenhair
Asparagaceae	*Asparagus aethiopicus**	Asparagus Fern
Asteraceae	*Hypochaeris radicata**	Flatweed
Asteraceae	*Senecio madagascariensis**	Fireweed
Asteraceae	*Taraxacum officinale**	Dandelion
Bignoniaceae	*Pandorea pandorana*	Wonga Vine
Campanulaceae	*Wahlenbergia gracilis*	Australian Bluebell
Casuarinaceae	*Allocasuarina sp.*	
Convolvulaceae	*Dichondra repens*	Kidney Weed
Convolvulaceae	*Ipomoea indica**	Morning Glory
Cyperaceae	*Gahnia clarkei*	Tall Saw-sedge
Dennstaedtiaceae	*Histiopteris incisa*	Bat's Wing Fern
Dennstaedtiaceae	*Pteridium esculentum*	Bracken
Dilleniaceae	*Hibbertia scandens*	Climbing Guinea Flower
Doryanthaceae	*Doryanthes excelsa*	Gymea Lily
Epacridaceae	*Leucopogon juniperinus*	Prickly Beard-heath
Euphorbiaceae	*Alchornea ilicifolia*	Native Holly
Euphorbiaceae	*Breynia oblongifolia*	Coffee Bush
Euphorbiaceae	*Glochidion ferdinandii*	Cheese Tree
Euphorbiaceae	*Ricinus communis**	Castor Oil Plant
Fabaceae	*Daviesia ulicifolia subsp. ulicifolia*	
Fabaceae	*Erythrina x sykesii**	Coral tree
Fabaceae	*Glycine tabacina 'l' form f. 'l'*	
Fabaceae	*Vicia sativa**	Common vetch
Fabaceae	*Acacia longifolia*	
Fabaceae	*Senna pendula var. glabrata**	-
Fabaceae	*Hardenbergia violacea*	False Sarsaparilla
Fabaceae	*Kennedia rubicunda*	Dusky Coral Pea
Fabaceae	*Acacia falcata*	-
Fabaceae	*Acacia suaveolens*	Sweet Scented Wattle
Fabaceae	*Acacia ulicifolia*	Prickly Moses
Lauraceae	*Cassytha pubescens*	Common Devil's Twine
Lauraceae	*Cinnamomum camphora**	Camphor Laurel
Lobeliaceae	*Pratia purpurascens*	Whiteroot
Lomandraceae	*Lomandra longifolia*	Spiky-headed Mat-rush
Luzuriagaceae	*Eustrephus latifolius*	Wombat Berry

Family	Scientific Name	Common Name
Malvaceae	*Sida rhombifolia**	Paddy's Lucerne
Myrtaceae	*Angophora costata*	Smooth-barked Apple
Myrtaceae	*Corymbia gummifera*	Red Bloodwood
Myrtaceae	*Corymbia maculata*	Spotted Gum
Myrtaceae	*Eucalyptus Capitellata*	Brown Stringybark
Myrtaceae	*Eucalyptus siderophloia*	Northern Grey Ironbark
Myrtaceae	*Eucalyptus umbra*	Broad-leaved White Mahogany
Orchidaceae	*Caladenia sp.*	
Phormiaceae	*Dianella caerulea var. caerulea*	Flax Lily
Pittosporaceae	*Billardiera scandens*	Hairy Appleberry
Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum
Poaceae	*Briza maxima**	Quaking Grass
Poaceae	*Briza minor**	Shivery Grass
Poaceae	*Cymbopogon refractus*	Barbwire Grass
Poaceae	*Cynodon dactylon*	Common Couch
Poaceae	*Entolasia marginata*	Bordered Panic
Poaceae	*Entolasia stricta*	Wiry Panic
Poaceae	*Hyparrhenia hirta**	Coolatai Grass
Poaceae	*Imperata cylindrica*	Blady Grass
Poaceae	*Stenotaphrum secundatum**	Buffalo Grass
Poaceae	*Themeda australis*	Kangaroo Grass
Proteaceae	*Banksia spinulosa*	Hairpin Banksia
Proteaceae	*Persoonia linearis*	Narrow-leaved Geebung
Rosaceae	*Rubus idaeus**	Raspberry
Rubiaceae	*Pomax umbellata*	Pomax
Sapindaceae	*Dodonaea triquetra*	Hop-bush
Sinopteridaceae	*Cheilanthes distans*	Bristly Cloak Fern
Smilacaceae	*Smilax glyciphylla*	Sarsaparilla
Thymelaeaceae	*Pimelea linifolia*	Slender Rice Flower
Tremandraceae	*Tetratheca juncea*	Black-eyed Susan
Verbenaceae	*Lantana camara**	Lantana
Verbenaceae	*Verbena bonariensis**	Purpletop
Violaceae	*Viola hederacea*	Ivy-leaved Violet
Xanthorrhoeaceae	*Xanthorrhoea sp.*	

Appendix B – Expected Fauna Species List

EXPECTED FAUNA SPECIES LIST

The following list includes fauna species that could be reasonably expected to occur on the Subject Site at some point, given site attributes and location.

"●" – species observed or indicated by scats, tracks etc. on, over or near the site during recent surveys by AEP (2021).

Threatened species listed under the *Biodiversity Conservation Act 2016* (BC Act) or the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) are indicated in **bold font**.

Family	Scientific Name	Common Name	Status	Present
Amphibians				
Myobatrachidae	*Crinia signifera*	Common Eastern Froglet		●
Myobatrachidae	*Pseudophryne bibronii*	Bibron's Toadlet		
Myobatrachidae	*Pseudophryne coriacea*	Red-backed Toadlet		
Hylidae	*Litoria caerulea*	Green Tree Frog		
Hylidae	*Litoria dentata*	Bleating Tree Frog		
Hylidae	*Litoria fallax*	Eastern Dwarf Tree Frog		
Hylidae	*Litoria freycineti*	Freycinet's Frog		
Hylidae	*Litoria gracilenta*	Dainty Green Tree Frog		
Hylidae	*Litoria jervisiensis*	Jervis Bay Tree Frog		
Hylidae	*Litoria peronii*	Peron's Tree Frog		
Hylidae	*Litoria revelata*	Revealed Frog		
Hylidae	*Litoria tyleri*	Tyler's Tree Frog		
Limnodynastidae	*Limnodynastes peronii*	Brown-striped Frog		
Reptiles				
Scincidae	*Anomalopus swansoni*	Punctate Worm-skink		
Scincidae	*Bellatorias major*	Land Mullet		
Scincidae	*Carlia tetradactyla*	Southern Rainbow-skink		
Scincidae	*Concinnia tenuis*	Barred-sided Skink		
Scincidae	*Ctenotus robustus*	Robust Ctenotus		
Scincidae	*Ctenotus taeniolatus*	Copper-tailed Skink		
Scincidae	*Eulamprus quoyii*	Eastern Water-skink		
Scincidae	*Lampropholis delicata*	Dark-flecked Garden Sunskink		
Scincidae	*Lampropholis guichenoti*	Pale-flecked Garden Sunskink		
Scincidae	*Lampropholis sp.*	Unidentified Skink		●
Scincidae	*Saiphos equalis*	Three-toed Skink		
Scincidae	*Tiliqua scincoides*	Eastern Blue-tongue		
Agamidae	*Pogona barbata*	Bearded Dragon		
Varanidae	*Varanus varius*	Lace Monitor		
Colubridae	*Dendrelaphis punctulatus*	Common Tree Snake		
Elapidae	*Cacophis squamulosus*	Golden-crowned Snake		
Elapidae	*Pseudechis porphyriacus*	Red-bellied Black Snake		
Elapidae	*Pseudonaja textilis*	Eastern Brown Snake		
Aves				
Anatidae	*Anas castanea*	Chestnut Teal		

Family	Scientific Name	Common Name	Status	Present
Anatidae	*Anas superciliosa*	Pacific Black Duck		
Anatidae	*Chenonetta jubata*	Australian Wood Duck		
Columbidae	*Columba livia*	Rock Dove		
Columbidae	*Geopelia humeralis*	Bar-shouldered Dove		
Columbidae	*Leucosarcia melanoleuca*	Wonga Pigeon		
Columbidae	*Lopholaimus antarcticus*	Topknot Pigeon		
Columbidae	*Ocyphaps lophotes*	Crested Pigeon		●
Columbidae	*Phaps chalcoptera*	Common Bronzewing		
Columbidae	*Spilopelia chinensis*	Spotted Turtle-Dove		
Podargidae	*Podargus strigoides*	Tawny Frogmouth		
Caprimulgidae	*Eurostopodus mystacalis*	White-throated Nightjar		
Aegothelidae	*Aegotheles cristatus*	Australian Owlet-nightjar		
Apodidae	*Hirundapus caudacutus*	White-throated Needletail		
Accipitridae	*Accipiter fasciatus*	Brown Goshawk		
Accipitridae	*Accipiter novaehollandiae*	Grey Goshawk		
Accipitridae	*Aviceda subcristata*	Pacific Baza		
Accipitridae	*Circus approximans*	Swamp Harrier		
Accipitridae	*Elanus axillaris*	Black-shouldered Kite		
Accipitridae	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	V	
Accipitridae	*Haliastur sphenurus*	Whistling Kite		
Falconidae	*Falco cenchroides Concinna*	Nankeen Kestrel		
Charadriidae	*Vanellus miles*	Masked Lapwing		
Cacatuidae	*Cacatua galerita*	Sulphur-crested Cockatoo		
Cacatuidae	*Cacatua sanguinea*	Little Corella		
Cacatuidae	*Cacatua tenuirostris*	Long-billed Corella		
Cacatuidae	*^^Calyptorhynchus lathami*	Glossy Black-Cockatoo	V	
Cacatuidae	*Eolophus roseicapilla*	Galah		
Cacatuidae	*Zanda funereus*	Yellow-tailed Black-Cockatoo		
Psittacidae	*Alisterus scapularis*	Australian King-Parrot		
Psittacidae	*Glossopsitta concinna*	Musk Lorikeet		
Psittacidae	*Glossopsitta pusilla*	Little Lorikeet	V	
Psittacidae	*Platycercus elegans*	Crimson Rosella		
Psittacidae	*Platycercus eximius*	Eastern Rosella		●
Psittacidae	*Trichoglossus chlorolepidotus*	Scaly-breasted Lorikeet		
Psittacidae	*Trichoglossus haematodus*	Rainbow Lorikeet		●

Family	Scientific Name	Common Name	Status	Present
Cuculidae	*Cacomantis flabelliformis*	Fan-tailed Cuckoo		
Cuculidae	*Centropus phasianinus*	Pheasant Coucal		
Cuculidae	*Chalcites lucidus*	Shining Bronze-Cuckoo		
Cuculidae	*Eudynamys orientalis*	Eastern Koel		
Cuculidae	*Scythrops novaehollandiae*	Channel-billed Cuckoo		
Strigidae	*Ninox novaeseelandiae*	Southern Boobook		
Strigidae	*Ninox strenua*	Powerful Owl	V	
Tytonidae	*Tyto javanica*	Eastern Barn Owl		
Tytonidae	*Tyto novaehollandiae*	Masked Owl	V	
Alcedinidae	*Ceyx azureus*	Azure Kingfisher		
Alcedinidae	*Dacelo novaeguineae*	Laughing Kookaburra		●
Alcedinidae	*Todiramphus sanctus*	Sacred Kingfisher		
Coraciidae	*Eurystomus orientalis*	Dollarbird		
Climacteridae	*Cormobates leucophaea*	White-throated Treecreeper		●
Ptilonorhynchidae	*Ptilonorhynchus violaceus*	Satin Bowerbird		
Maluridae	*Malurus cyaneus*	Superb Fairy-wren		●
Maluridae	*Malurus lamberti*	Variegated Fairy-wren		
Acanthizidae	*Acanthiza lineata*	Striated Thornbill		
Acanthizidae	*Acanthiza nana*	Yellow Thornbill		
Acanthizidae	*Acanthiza pusilla*	Brown Thornbill		
Acanthizidae	*Gerygone mouki*	Brown Gerygone		
Acanthizidae	*Gerygone olivacea*	White-throated Gerygone		
Acanthizidae	*Sericornis frontalis*	White-browed Scrubwren		
Pardalotidae	*Pardalotus punctatus*	Spotted Pardalote		●
Pardalotidae	*Pardalotus striatus*	Striated Pardalote		●
Meliphagidae	*Acanthorhynchus tenuirostris*	Eastern Spinebill		
Meliphagidae	*Anthochaera carunculata*	Red Wattlebird		●
Meliphagidae	*Anthochaera chrysoptera*	Little Wattlebird		
Meliphagidae	*Caligavis chrysops*	Yellow-faced Honeyeater		●
Meliphagidae	*Entomyzon cyanotis*	Blue-faced Honeyeater		
Meliphagidae	*Lichmera indistincta*	Brown Honeyeater		
Meliphagidae	*Manorina melanocephala*	Noisy Miner		●
Meliphagidae	*Meliphaga lewinii*	Lewin's Honeyeater		
Meliphagidae	*Melithreptus brevirostris*	Brown-headed Honeyeater		
Meliphagidae	*Myzomela sanguinolenta*	Scarlet Honeyeater		●

Family	Scientific Name	Common Name	Status	Present
Meliphagidae	*Philemon corniculatus*	Noisy Friarbird		●
Meliphagidae	*Phylidonyris niger*	White-cheeked Honeyeater		
Meliphagidae	*Phylidonyris novaehollandiae*	New Holland Honeyeater		
Meliphagidae	*Plectorhyncha lanceolata*	Striped Honeyeater		
Psophodidae	*Psophodes olivaceus*	Eastern Whipbird		
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella	V	
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike		●
Pachycephalidae	*Colluricincla harmonica*	Grey Shrike-thrush		●
Pachycephalidae	*Pachycephala pectoralis*	Golden Whistler		
Oriolidae	*Oriolus sagittatus*	Olive-backed Oriole		●
Oriolidae	*Sphecotheres vieilloti*	Australasian Figbird		
Artamidae	*Artamus cyanopterus Concinna*	Dusky Woodswallow	V	●
Artamidae	*Artamus leucoryn*	White-breasted Woodswallow		
Artamidae	*Cracticus nigrogularis*	Pied Butcherbird		●
Artamidae	*Cracticus torquatus*	Grey Butcherbird		
Artamidae	*Gymnorhina tibicen*	Australian Magpie		●
Artamidae	*Strepera graculina*	Pied Currawong		●
Rhipiduridae	*Rhipidura albiscapa*	Grey Fantail		●
Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail		
Rhipiduridae	*Rhipidura rufifrons*	Rufous Fantail		
Corvidae	*Corvus coronoides*	Australian Raven		●
Monarchidae	*Grallina cyanoleuca*	Magpie-lark		
Monarchidae	*Myiagra rubecula*	Leaden Flycatcher		
Corcoracidae	*Corcorax melanorhamphos*	White-winged Chough		
Petroicidae	*Eopsaltria australis*	Eastern Yellow Robin		
Petroicidae	*Microeca fascinans*	Jacky Winter		
Cisticolidae	*Cisticola exilis*	Golden-headed Cisticola		
Hirundinidae	*Hirundo neoxena*	Welcome Swallow		
Sturnidae	*Acridotheres tristis*	Common Myna		
Sturnidae	*Sturnus vulgaris*	Common Starling		
Zosteropidae	*Zosterops lateralis*	Silvereye		●
Estrildidae	*Neochmia temporalis*	Red-browed Finch		
Motacillidae	*Anthus novaeseelandiae*	Australian Pipit		
Mammals				
Tachyglossidae	*Tachyglossus aculeatus*	Short-beaked Echidna		

Family	Scientific Name	Common Name	Status	Present
Dasyuridae	*Antechinus mimetes*	Mainland Dusky Antechinus		
Dasyuridae	*Antechinus stuartii*	Brown Antechinus		
Dasyuridae	*Dasyurus maculatus*	Spotted-tailed Quoll	V, E	
Peramelidae	*Isoodon macrourus*	Northern Brown Bandicoot		
Peramelidae	*Perameles nasuta*	Long-nosed Bandicoot		
Phascolarctidae	*Phascolarctos cinereus*	Koala	V	
Petauridae	*Petaurus breviceps*	Sugar Glider		
Petauridae	*Petaurus norfolcensis*	Squirrel Glider	V	
Pseudocheiridae	*Pseudocheirus peregrinus*	Common Ringtail Possum		
Acrobatidae	*Acrobates pygmaeus*	Feathertail Glider		
Phalangeridae	*Trichosurus vulpecula*	Common Brushtail Possum		
Macropodidae	*Macropus giganteus*	Eastern Grey Kangaroo		●
Macropodidae	*Notamacropus rufogriseus*	Red-necked Wallaby		
Macropodidae	*Wallabia bicolor*	Swamp Wallaby		
Pteropodidae	*Pteropus poliocephalus*	Grey-headed Flying-fox	V	
Pteropodidae	*Pteropus scapulatus*	Little Red Flying-fox		
Rhinolophidae	*Rhinolophus megaphyllus*	Eastern Horseshoe-bat		
Molossidae	*Austronomus australis*	White-striped Freetail-bat		
Molossidae	*Micronomus norfolkensis*	Eastern Coastal Free-tailed Bat	V	
Molossidae	*Ozimops ridei*	Eastern Free-tailed Bat		
Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat		
Vespertilionidae	*Chalinolobus morio*	Chocolate Wattled Bat		
Vespertilionidae	*Falsistrellus tasmaniensis*	Eastern False Pipistrelle	V	
Vespertilionidae	*Myotis macropus*	Southern Myotis	V	
Vespertilionidae	*Nyctophilus geoffroyi*	Lesser Long-eared Bat		
Vespertilionidae	*Nyctophilus gouldi*	Gould's Long-eared Bat		
Vespertilionidae	*Scoteanax rueppellii*	Greater Broad-nosed Bat	V	
Vespertilionidae	*Scotorepens orion*	Eastern Broad-nosed Bat		
Vespertilionidae	*Vespadelus pumilus*	Eastern Forest Bat		
Vespertilionidae	*Vespadelus regulus*	Southern Forest Bat		
Vespertilionidae	*Vespadelus troughtoni*	Eastern Cave Bat	V	
Vespertilionidae	*Vespadelus vulturnus*	Little Forest Bat		
Miniopteridae	*Miniopterus australis*	Little Bent-winged Bat	V	
Miniopteridae	*Miniopterus orianae oceanensis*	Large Bent-winged Bat	V	
Muridae	*Mus musculus*	House Mouse		

Family	Scientific Name	Common Name	Status	Present
Muridae	*Rattus fuscipes*	Bush Rat		
Muridae	*Rattus lutreolus*	Swamp Rat		
Muridae	*Rattus Nonsteroidal*	Black Rat		
Canidae	*Canis lupus*	Dingo, domestic dog		
Canidae	*Vulpes Nonsteroidal*	Fox		
Felidae	*Felis catus*	Cat		
Leporidae	*Lepus capensis*	Hare		
Leporidae	*Oryctolagus cuniculus*	Rabbit		

Appendix C – Site Photographs

Site of proposed reservoir 1 & 2. PCT 1589.

Site of proposed watermain alignment. PCT 1619.

Grey Kangaroo scat

***Tetratheca juncea* (Black-eyed Susan)**

***Tetratheca juncea* (Black-eyed Susan)**

Appendix F Non-Aboriginal Heritage Assessment

HERITAGE NOW
VALUING OUR PAST - CREATING OUR FUTURE

Project Number: HN000314-B

STATEMENT OF HERITAGE IMPACT – WEST WALLSEND RESERVOIR

FINAL 24 / 06 / 2022

REPORT TO JM ENVIRONMENTS
37 Tooke Street, Cooks Hill, 2300, Newcastle, NSW

REPORT BY HERITAGE NOW PTY LTD
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Executive Summary

Heritage Now Pty Ltd (Heritage Now) was engaged by JM Environments, for Hunter Water Corporation (Hunter Water), to undertake a Statement of Heritage Impact (SoHI) for a Review of Environmental Factors report addressing construction and installing a reservoir and pipelines at Cameron Park and West Wallsend (the Proposal).

There are two heritage listings relevant to these works, both of local significance on the Lake Macquarie 2014 LEP s170 heritage registers: *West Wallsend Valve House and Underground Reservoir* and *West Wallsend (No 1) Colliery*. The proposal involves decommissioning some of the current water infrastructure at the West Wallsend Reservoir, such as the 1980s pumping station building and other modern pump set which are not significant built heritage items under the heritage listing, but are within the curtilage of the *West Wallsend Valve House and Underground Reservoir* and *West Wallsend (No 1) Colliery*. The significant fabric, the valve house and reservoir, are will be retained. There will be no demolition of significant fabric or buildings associated with the heritage listings.

This assessment determined that the Proposal will have a negligible impact on locally listed *West Wallsend Valve House and Underground Reservoir* (LEP I207) and *West Wallsend (No 1) Colliery* (LEP I220). By upgrading the water infrastructure in the area, yet retaining the heritage items of historical fabric (the reservoir and valve house), and archivally recording the post-1950s water infrastructure being removed, the heritage values of the original water infrastructure are maintained. Some proposed drilling is within the area of the *West Wallsend (No 1) Colliery* (LEP I220) curtilage. Based on the site inspection is not expected that any archaeological features are preserved within the Project Area. Therefore, as long as an unexpected finds procedure is in place, the proposed drilling path will not have an impact to the heritage values of this heritage listing.

The Proposal can proceed in accordance with the following recommendations:

Recommendation 1

Archival recording of the post-1950s water infrastructure and building to be demolished should be undertaken, while this is not significant fabric, it contributes to an understanding of the site and thus is to be recorded. The archival recording should be undertaken in accordance with *Photographic Recording of Heritage Items Using Film or Digital Capture* (Heritage Office 1994). The archival recording report will be submitted to the local council library for public access, to the local council, and to Hunter Water.

Recommendation 2

If the 1903/04 pipeline from Minmi is required to be replaced by Hunter Water in order to complete the Proposal, some intact lengths should be retained next to the valve house, and interpretation signage installed. No heritage permit is required as the pipeline is not considered a 'relic' under the *Heritage Act* 1977.

Recommendation 3

A heritage induction is to be provided to all on-site personnel undertaking construction works so that they understand their obligations for protecting heritage under the *Heritage Act* 1977, which includes the reporting of archaeological or suspected archaeological material.

Recommendation 4

In the unlikely event archaeological, or suspected archaeological, material is uncovered during works, then works in that area are to cease and the area is to be cordoned off. The material is to be inspected by a heritage consultant and works in that area are only to recommence once heritage clearance has been gained and/or mitigation and management measures implemented.

Recommendation 5

Notification of the works involving the locally listed heritage items, which should include this report, should be sent to Lake Macquarie City Council.

Acronyms, Terms and Definitions

Acronym/Term	Definition
CMP	Conservation Management Plan
DCDB	Digital Cadastral Database (NSW)
DCP	Development Control Plan
EP&A Act	Environmental Planning and Assessment Act
LEP	Local Environmental Plan
HLRV	Historical Land Records Viewer (NSW)
LGA	Local Government Area
OEH	Office of Environment and Heritage, NSW
m	Metric metres
SHR	State Heritage Register
SIX Maps	Spatial Information Exchange (NSW government portal holding a range of spatial and property data)
SoHI	Statement of Heritage Impact

Version Control

Version	Reviewed by	Review Date	Revision Description	Approved by	Approved Date
Draft	Stephen Booker Heritage Architect, Heritage Now Consultant	15/5/2022	Draft for Client	Tessa Boer-Mah, Heritage Now, Principal Heritage Consultant	17/5/2022
Final	Tessa Boer-Mah, Heritage Now, Principal Heritage Consultant	24/5/2022	Final for Client	Tessa Boer-Mah, Heritage Now, Principal Heritage Consultant	24/5/2022

Contents

Tables

Figures

Plates

1 Introduction

Heritage Now Pty Ltd (Heritage Now) was engaged by JM Environments, for Hunter Water Corporation (Hunter Water), to undertake a Statement of Heritage Impact (SoHI) for a Review of Environmental Factors report addressing construction and installing a reservoir and pipelines at Cameron Park and West Wallsend (the Proposal).

There are two heritage listings relevant to these works, both of local significance on the Lake Macquarie 2014 LEP s170 heritage registers: *West Wallsend Valve House and Underground Reservoir* and *West Wallsend (No 1) Colliery*. The proposal involves decommissioning some of the current water infrastructure at the West Wallsend Reservoir, such as the 1980s pumping station building and other modern pump set, however the items with heritage fabric (the valve house and reservoir) are planned to be retained.

1.1 Project Area

The location of the Proposal (the Project Area) is located in Cameron Park and West Wallsend (Figure 1) and encompasses six lots (Table 1). The northern-most portions of the Project Area are north-west and west of the intersection of Carlington Street, George Booth Drive and Cameron Park Drive. It then runs parallel to George Booth Drive towards the intersection with Wallsend Road, at which point it turns east for approximately 500 metres.

The current SoHI covers the portions of the Project Area which contain heritage items (the SoHI Study Area) (Figure 3). The SoHI Study Area is at 30a George Booth Drive (corner of George Booth Drive and Carrington St), West Wallsend 2286, with works occurring around the West Wallsend Reservoir and Valve House (which includes ancillary buildings), as well as pipe infrastructure from the street.

Table 1. Lots and DPs encompassed by Project Area.

Lot	DP
1	923578
1	1156170
1	367540
2999	1260247
3	1134639
106	1000408

Figure 1. The Project Area. It is in Zone 56 and Parish of Teralba. (Source: SIX Maps aerial, DCDB data, and Heritage Now additions) (Source: Six Maps with Heritage Now additions).

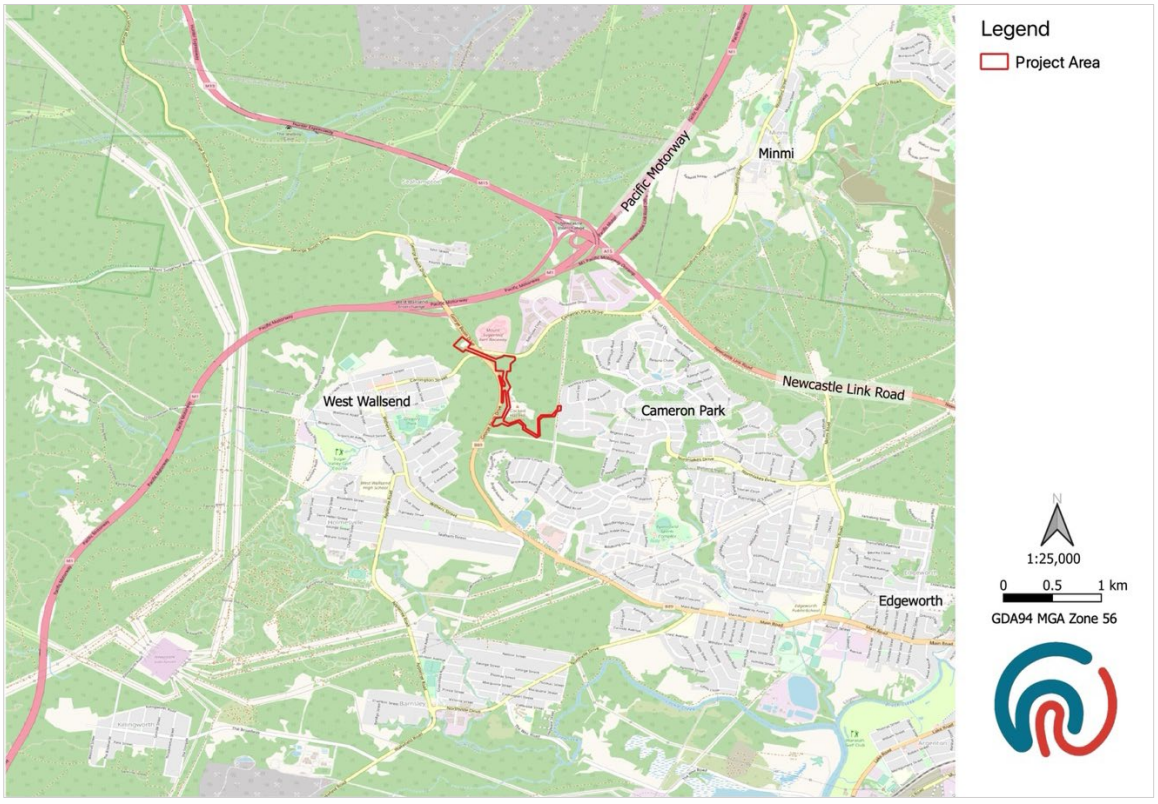

Figure 2. The Project Area in a regional context. (Source: Six Maps with Heritage Now additions).

Figure 3. The Project Area and SoHI Study Area. (Source: SIX Maps aerial with DCDB data and Heritage Now additions])

1.2 The Proposal

Hunter Water are proposing to construct a new reservoir and associated pipelines. The key features of the Proposal include:

- Construction of access and driveway of George Booth Drive;
- Construction of a 3.25 ML Water Reservoir (the reservoir);
- Connection of Reservoir to various existing water mains; and
- Decommissioning of existing Reservoir and West Wallsend 2 WPS.

The proposed works are shown in Figure 4.

In regards to the SOHI Study Area, works will include drilling between 0-7m below ground surfaces, to connect the new watermains to old watermains. The Valve House and Reservoir (Heritage Items) are planned to be retained. Hunter Water are considering filling the reservoir with sand for safety of the general public. Ancillary modern building which does not contain significant fabric and is not part of the heritage listing (near the Valve House) is reported (by the client) to have has termite damage and will be decommissioned and removed.

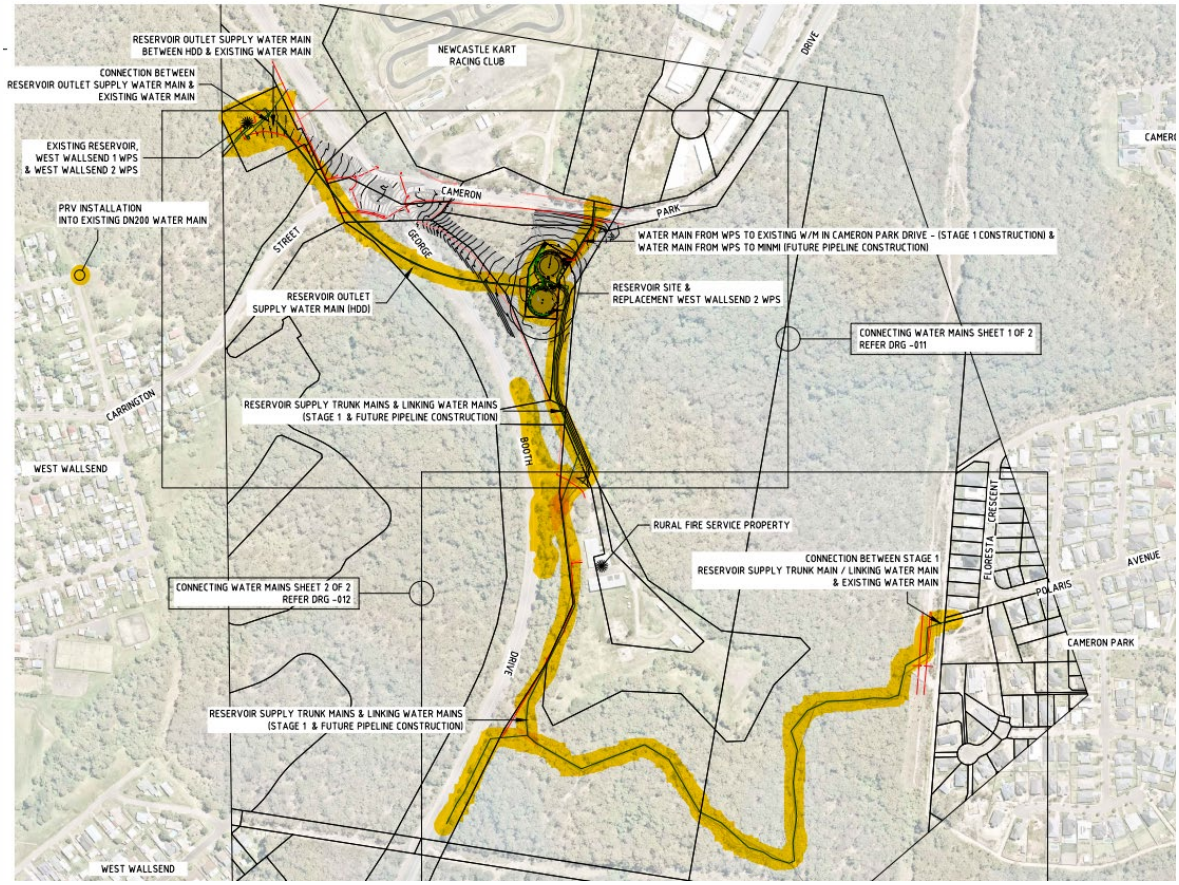

Figure 4. Excerpt from plans of works. (Source: Client)

1.3 Methodology

This document was prepared in accordance with the relevant Heritage NSW guidelines, including, but not limited to:

- Assessing Heritage Significance[1]
- Statements of Heritage Impact[2]

This Statement of Heritage Impact includes:

- An overview of the heritage significance of features concerning the Proposal
- What impact the proposed works will have on that significance
- What measures have been proposed to mitigate negative impacts
- Why more sympathetic solutions are not viable

[1] Heritage Office NSW [now Heritage NSW], *Assessing Heritage Significance* (Sydney, NSW: Office of Environment and Heritage, 2015).
[2] Heritage Office NSW [now Heritage NSW], *Statements of Heritage Impact* (Sydney, NSW: Heritage Office NSW, 2002).

1.4 Authorship

This report was produced by the Heritage Now team. The report was written by Lara Tooby (Heritage Consultant), with input from Kira Paznikov (Heritage Officer), and Cathy Villamor (Heritage Officer). Technical input and quality review was provided by Stephen Booker (Heritage Architect) and Tessa Boer-Mah, Principal Heritage Consultant at Heritage Now.

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2 Historic Context

This section provides the foundation for understanding the history of the region, as well as the Project Area.

2.1 Development of West Wallsend

West Wallsend ("Westy's") in Awabakal Country, was established due to mining operations by the West Wallsend Coal Company Limited; with the colliery commencing production in July 1888 (Figure 4).[3]

Prior to this mining connection, "by 1865 a very scattered community of farmers was spread over the countryside now occupied by the townships of Barnsley, West Wallsend and Edgeworth", with the first subdivision plan for the area given to the Registrar General on April 17, 1886.[4] Early European settlers included William Johnston and his family who moved to West Wallsend in 1887, subsequently building the Museum Hotel.[5]

On July 23, 1888 the Newcastle Herald reported that "one of the most successful land sales of the year was held by Messrs. J Creer & Son on Saturday last at West Wallsend ... there must have been about 1500 persons present",[6] highlighting the popularity of West Wallsend even in the 1800s. The first Post Office opened in July 1888 and, in 1891, a Telegraph station and Money Order office became available to the community.[7]The first school in West Wallsend was opened in 1889 and, by 1899, there were 355 students in attendance.[8]

> "*Westy's foundations were laid on Borehole Coal. They appeared solid at the time. The town's prosperity and distinction as the most important mining centre in the Newcastle district was spectacular. It had a life span on coal mining of 40 years*."[9]

The coal industry flourished in the area, and the town expanded accordingly until December 1910 (Figure 5),[10]when an explosion at the Killingworth Colliery closed it for a period of four years. In the 1920's, borehole mining was not as popular as it once was and a miners' lockout began in 1929, lasting seventeen weeks and resulting in an economically depressed West Wallsend.[11]

Employment could be found at the nearby Stockrington Colliery until 1956; however, by this stage, most people had secured employment in Newcastle due to improvements in transport networks. By

[3] Lake Macquarie Libraries, 'West Wallsend', Community History-Lake Macquarie, accessed 27 April 2022, https://history.lakemac.com.au/page-local-history.aspx?pid=1085&vid=20&tmpt=narrative&narid=89.
[4] T.G. Reynolds, *Early West Wallsend (Westy): Its People and Places* (West Wallsend, New South Wales., 1989), 186.
[5] Lake Macquarie Libraries, 'West Wallsend'.
[6] 'West Wallsend Land Sale', *Newcastle Morning Herald and Miners' Advocate*, 23 July 1888, http://nla.gov.au/nla.news-article135920404.
[7] *Back To 'Westy': West Wallsend Centenary Celebrations*, 1963, 43.
[8] Lake Macquarie Libraries, 'West Wallsend'.
[9] *Back To 'Westy': West Wallsend Centenary Celebrations*, 7.
[10] 'View of Town - West Wallsend, NSW', State Library of NSW, accessed 17 February 2022, https://search.sl.nsw.gov.au/primo-explore/fulldisplay?docid=ADLIB110308873&context=L&vid=SLNSW&lang=en_US&search_scope=MOH&adaptor=Local%20Search%20Engine&tab=default_tab&query=any,contains,%22WEST%20WALLSEND%22&offset=0.
[11] *Back To 'Westy': West Wallsend Centenary Celebrations*, 9.

West Wallsend's Centenary in 1963 it was noted that "a transformation has taken place in "Westy" and the community is happy and prosperous again...Westy is more stable to-day than ever it was in the heyday of its coal mining activities".[12] Population figures from Lake Macquarie Council are testament to this statement, with 40 people living in West Wallsend in 1887, and increasing to 2687 by 1961.[13]

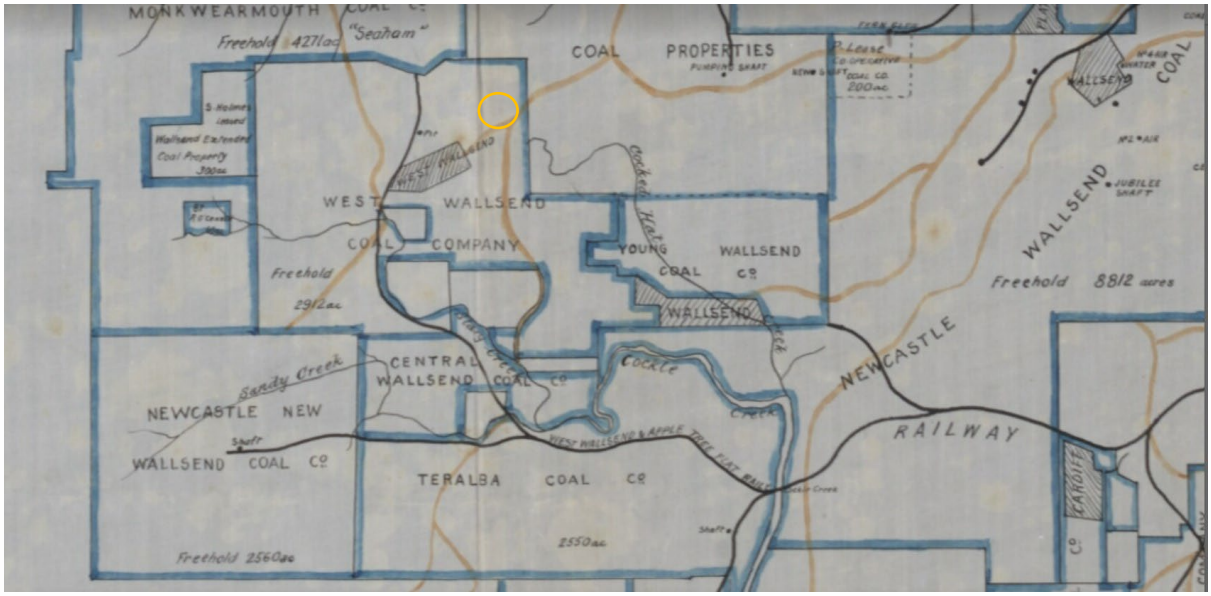

Figure 5. 1900/1910 map of coal properties around West Wallsend, with current Project Area circled in yellow (nla.obj-229953448-1.jpg).

Figure 6. View of Withers St, West Wallsend, NSW Circa 1910 (Source: State Library of New South Wales)

[12] *Back To 'Westy': West Wallsend Centenary Celebrations*, 11.
[13] Lake Macquarie Libraries, 'West Wallsend'.

2.2 The History of the Project Area

The underground Reservoir and Valve House reflects the growth of West Wallsend on the basis of the coal industry. The population of the Newcastle region, including West Wallsend, obtained water from the Hunter River from 1815 to 1886 through the Walka pumping scheme, until a second source, Chichester Dam, began to supply water in 1923.[14] However, citizens also used roof tanks, and many industries, including colliers were supplied by private dams.[15] Before the reservoir was used, water supply from West Wallsend came from W.W. Colliery Co. Engine Pond (from 1888).[16]

The West Wallsend Reservoir was part of the early expansion of the pumping scheme to extend to others area around Newcastle. In March 1902, the Project Area was demarked for a 'water conservation' scheme, and was previously part of the West Wallsend Company Limited land (Figure 6). In 1903/04, the government water supply was pumped from Hunter River via Minmi to West Wallsend, using a 6-inch cast-iron main (still in partial use, but now cement lined). The underground reservoir and valve house was added in 1905, to give a buffer for water supply and demand. Initially, aerials from 1944 (Figure 7) and 1954 showing the area as simply a cleared grass area marked by a small orange/red brick valve house, contrasting with surrounding lightly forested land. By 1984, aerials showed the construction of a second building to the west; this building was a pumping station constructed in 1981, to replace the elevated storage tanks (Figure 8). The valve house was reclad in the early 1990s. [17]

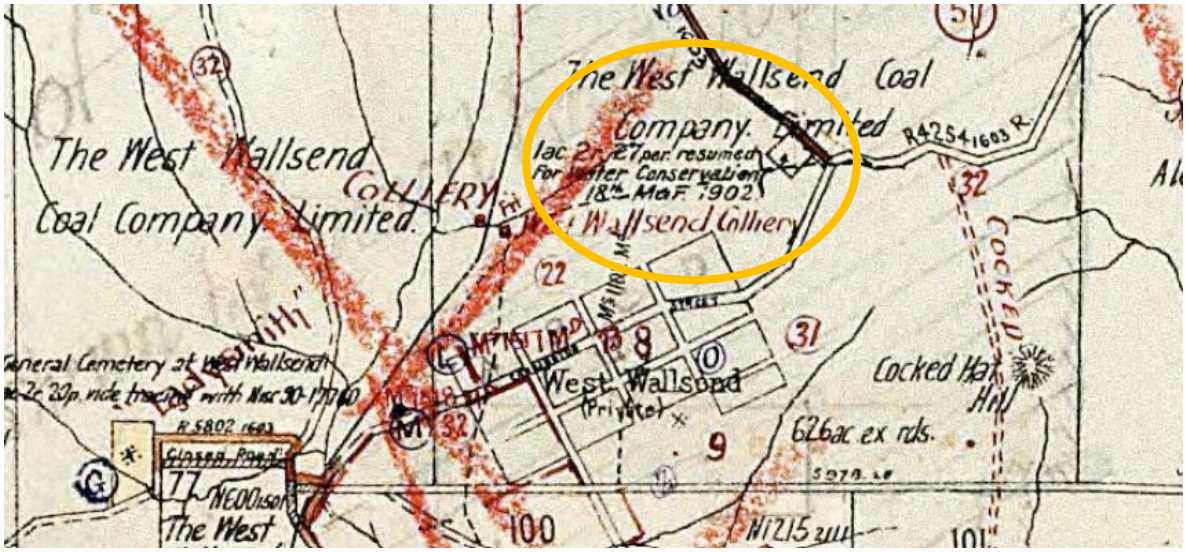

Figure 7. 1902 Parish Map of Teralba, showing the area of the current reservoir being marked out for water conservation (circled in yellow). (Source: HLRV 10869401.jp2)

[14] John W Armstrong, *Pipelines and People* (Hunter District Water Board, 1967), 67.
[15] Armstrong, 71.
[16] Suters Architects Snell, 'City of Lake Macquarie Heritage Study : Volume 1', Heritage Study (Speers Point, NSW: Report to Lake Macquarie Council, 1993), http://heritagensw.intersearch.com.au/heritagenswjspui/handle/1/5468.
[17] Suters Architects Snell.

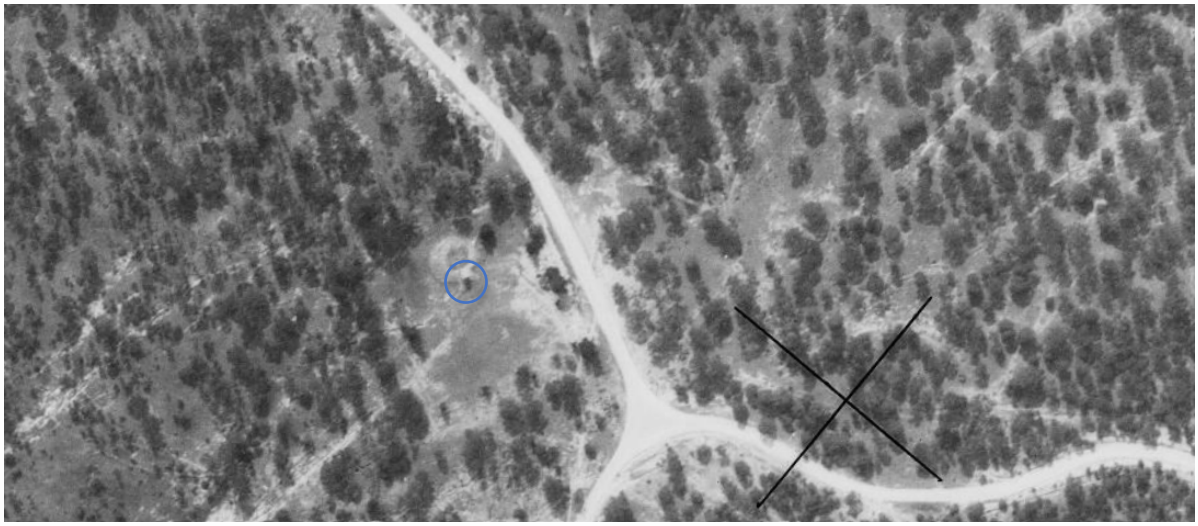

Figure 8. 1944 aerial, showing the valve house (circled blue). (Source: Spatial Services NSW)

Figure 9. 1984 aerial, showing the valve house (circled blue), and a new pumping station building (circled yellow). (Source: Spatial Services NSW)

3 Legislative Context and Heritage Listing

This section provides a brief overview of the relevant legislation and heritage listings pertaining to the Project Area at the time of writing the report. The legislative overview was provided solely as contextual information for the proponent and does not constitute legal advice.

3.1 Legislative Context

Non-Indigenous heritage in NSW is protected under the *Heritage Act* 1977 (the Heritage Act) and the *Environmental Planning & Assessment Act* 1979 (the EP&A Act). The State Heritage Register is maintained under Part 3A of the Heritage Act and comprises a list of places and objects of state significance to the people of NSW. Heritage items may be valued by particular groups in the community, such as Aboriginal communities, religious groups, or people with a common ethnic background. Local heritage items are registered by local councils in accordance with the EP&A Act and are listed in Local Environmental Plans (LEPs) and on the State Heritage Inventory.

Archaeological material is protected under the relics provision of the *Heritage Act* 1977, it includes any deposit, artefact, or material evidence that:

a. *Related to the settlement of the area that comprises New South Wales, not being of Aboriginal settlement, and*
b. *Is of State or local significance*

Items that do not meet these criteria are known as 'moveable objects' or 'works'. Moveable objects are defined simply as items that are not relics; works can refer to past evidence of infrastructure that is buried and therefore archaeological in nature. Examples of works may include, but are not limited to, former road surfaces or infrastructure associated with rail or trams. Exposure of such items does not trigger the reporting obligations under the relics provisions of the Heritage Act (Division 9).

Section 57 and Section 60 of the Heritage Act state that exemptions or permits may be required when undertaking works or excavating within the curtilage of a State Heritage Register item and applies to places, buildings, works, relics, moveable objects, precincts, or land within the Proposal. Where works are minor in nature and will have minimal impact on the heritage significance of a place, a Section 57 exemption may be granted (exemptions were recently updated in December 2020).

If works are not exempt under Section 57, a permit under Section 60 would be required to carry out activities to an item listed on the State Heritage Register. This includes built and ground disturbance in areas that are likely to contain archaeological material.

There are no items of State Significance identified within the SOHI Study Area. All built heritage items are listed as being of local significance.

Section 139 and 140 of the Heritage Act state that an excavation permit is required in certain circumstances, including where there is reasonable cause to suspect that a relic (not listed on an Interim Heritage Order or the State Heritage Register) may be discovered, exposed, moved or damaged, or where a relic has already been discovered or exposed. The Heritage Council may issue exceptions to this section where an archaeological assessment approved by the Heritage Council has indicated that there is little potential for relics to occur.

The archaeological potential is assessed in Section 4.

3.2 Heritage Listings and Other Relevant Instruments and Guidelines

Heritage items are registered on lists according to their level of significance: national, state, local, in rare cases they may be of world heritage significance.

The World Heritage List contains items which have international significance, and this list is administered by the United Nations Educational, Scientific and Cultural Organisation. Items of national significance are listed on the National Heritage List, which is administered by the Australian Heritage Council under the *Australian Heritage Council Act* 2003 and in accordance with the *Environmental Protection and Biodiversity Conservation Act* 1999.

The State Heritage Register contains items of state heritage significance and is administered by the NSW Heritage Council under the *NSW Heritage Act* 1977.

Items of local significance are protected under Local Environmental Plans (LEPs), in this case the Lake Macquarie LEP 2014.

Under Section 170 of the Heritage Act, government agencies are required to maintain a register of their heritage assets which is known as a s170 heritage register.

All heritage registers/listings were searched (Table 2): There are two Heritage Items overlapping with the Project Area: *West Wallsend Valve House and Underground Reservoir* (Item 207) and *West Wallsend (No 1) Colliery I* (Item 220) (Table 3 and Figure 3). The West Wallsend Heritage Area is 100m to the south west and the next closest heritage item is 345 metres to the south west, both the conservation area and the next closest heritage item cannot be seen from the Project Area due to vegetation and topography.

Table 2. Heritage listing search results for the Project Area

Listing	Result
World Heritage	0
National Heritage	0
Commonwealth Heritage	0
State Heritage	0
Local Heritage	2
S170 Heritage	2

Table 3. Heritage items within the Project Area

Item	Listing Type	Listed Name	ID	Significance	Item Type
Reservoir and Valve House	Lake Macquarie LEP	*West Wallsend Valve House & Underground Reservoir*	207	Local	Built

Item	Listing Type	Listed Name	ID	Significance	Item Type
	s170 register	*West Wallsend Reservoir and Valve House*	-		
West Wallsend Colliery	Lake Macquarie LEP	*West Wallsend (No 1) Colliery*	220	Local	Archaeological-Terrestrial
	s170 register	*Former West Wallsend (No.1) Colliery*	-		

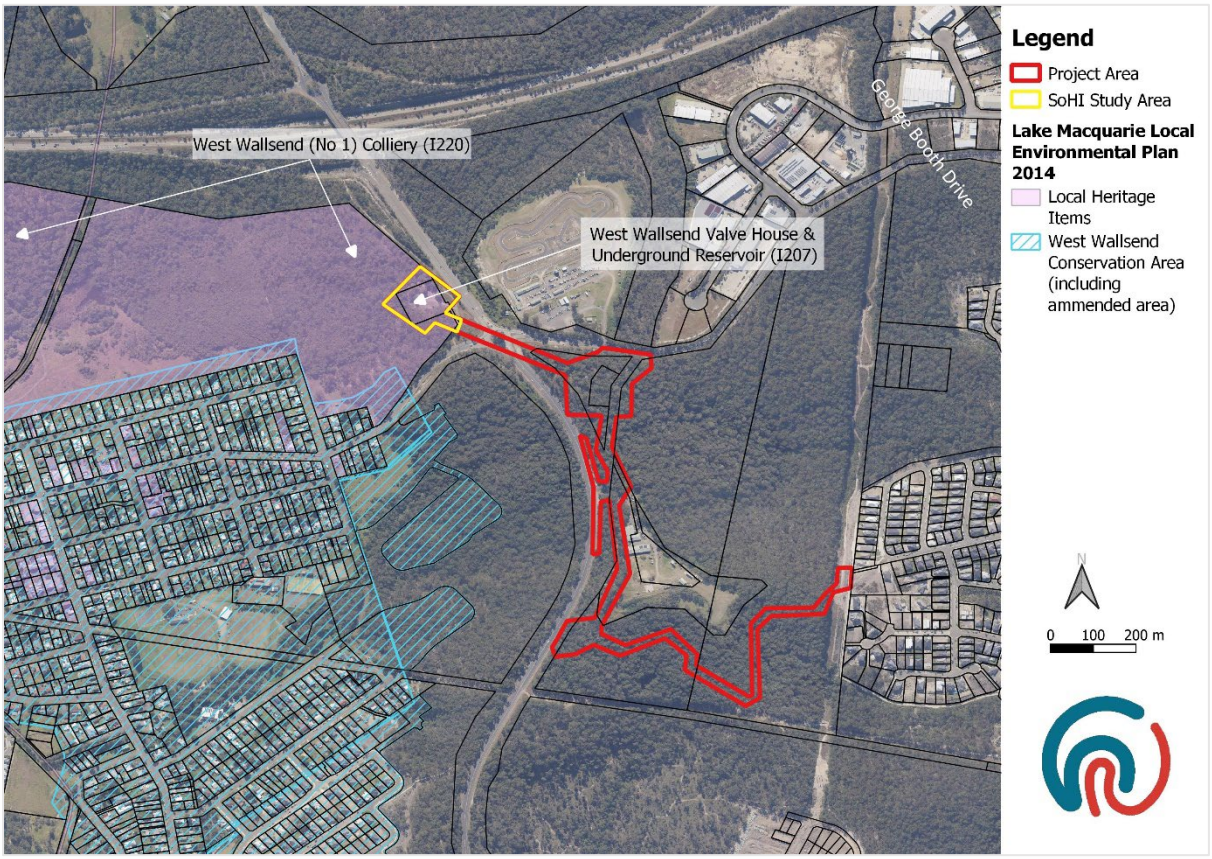

Figure 10. Local heritage listings in and around the Project Area. (Source: SIX Maps aerial with Lake Macquarie LEP Heritage items and Heritage Now additions)

3.2.1 Wallsend Valve House and Underground Reservoir

West Wallsend Valve House and Underground Reservoir (LEP I207) is characterised by a 1903/04 pipe from Minmi (considered to be a 'works' rather than a 'relic' heritage item under the *Heritage Act 1977,* is, a small-scale underground reservoir (c. 1905) and valve house (c. 1905). Existing ancillary items in the Listed Area include a pumping station building (c.1981) which houses electrical distribution, modern pumping station infrastructure, and additional stormwater pipes and watermains.

The following statements of significance are taken from the Lake Macquarie LEP and s170 State Heritage Inventory entries, respectively.

> *The Valve House & Underground Reservoir represent the provision of safe reticulated municipal water supply to this out-lying district at an unusually early date, & demonstrate the enlightened concern of the Government & municipal authorities, for the public's health. The Valve House is of good quality, evocative of its period & function & highly visible.*[18]

—

> *West Wallsend Reservoir and Valve House is a good example of a small-scale underground reservoir in a rural context. The reservoir was part of the early expansion of the Walka pumping scheme to extend the water supply into the areas surrounding Newcastle.*[19]

The following management summaries are taken from the Lake Macquarie LEP and s170 State Heritage Inventory entries, respectively.

> *Conserve the Valve House, Reservoir & cast-iron vent, even if they become redundant at some future date. Conserve the 1903/04 pipe line from Minmi in use if possible. If the pipeline is removed, keep some intact lengths for display next to the valve house. Refer the Valve House and Reservoir to the Hunter Water Board for inclusion in their Register of Heritage Items.* [20]

—

> *- This item contributes to local character and should be conserved.*
> *- Original details should be maintained including doors, windows and original signage.*
> *- New materials should be sympathetic to the nature and character of the original building.*
> *- In the event of major proposed changes, prepare a Conservation Management Strategy and undertake an archival recording.*
> *- Wherever possible, changes should be restricted to the interior of the building.*
> *- Routine maintenance of existing fabric is essential.* [21]

3.2.2 West Wallsend (No 1) Colliery

West Wallsend (No 1) Colliery (LEP I220) is a 50-ha area (Figure 9) where a major coal mine was once located. The current Project Area overlaps with 0.1 ha (<2%) of the heritage listed area. Extant evidence of the mining operations includes concrete mounting blocks for machinery, boiler house footings, workshop footings, concrete floor slabs, coal box piers, bottom of the 1st steel head-frame

[18] Heritage NSW, 'West Wallsend Valve House & Underground Reservoir', accessed 27 April 2022, https://www.hms.heritage.nsw.gov.au/App/Item/ViewItem?itemId=1910248.
[19] Heritage NSW, 'West Wallsend Reservoir and Valve House', accessed 27 April 2022, https://www.hms.heritage.nsw.gov.au/App/Item/ViewItem?itemId=3630032.
[20] Heritage NSW, 'West Wallsend Valve House & Underground Reservoir'.
[21] Heritage NSW, 'West Wallsend Reservoir and Valve House'.

in NSW, railway cutting and embankments, brick magazine, engine pond, winding cable used in fences. These items are located in a densely vegetated area.

The following statements of significance are taken from the Lake Macquarie LEP Heritage Inventory entries (which is the same as the s170 statement of significance).

> *West Wallsend Colliery is of State significance as it was the coal mine which led to establishment of West Wallsend, the largest town in Lake Macquarie, which now gives a name & focus to a much wider area.*
>
> *The significance of the colliery site is enhanced by it having the most substantial 19th Century remains of all the West Wallsend/Seaham group of collieries (these collieries were the basis for the population growth & prosperity of the local region).*
>
> *The site has easy public access & excellent potential for interesting interpretation. The steel headframe has State & possibly National significance, it has been the first all-steel colliery headframe in NSW (& probably Australia), & the forerunner of what is now the universal practice in construction.*
>
> *The steel headframe was relocated to a site next to the Argenton Mine Rescue Station to form part of a miner's memorial following an illegal attempt to dismantle it for scrap metal.*[22]

The following management summary is taken from the Lake Macquarie LEP State Heritage Inventory.

> *West Wallsend Colliery is an archaeological site of very high potential for interesting interpretation in an attractive open park-like setting, with the heritage site as its centre. Ruins such as these are a rare resource. Lambton Colliery has the only intact 19th Century colliery buildings in the region. West Wallsend has the most extensive 19th Century colliery ruins in the region.*
>
> *The colliery site (including surface works, railway cutting & embankment, pond, & hoisting cable fence), should be converted into a public recreation park, with interpretation of the mine as an easily accessible & highly visible focal point in an industrial heritage trail. It would thus become a valuable community asset.*
>
> *Funds should be sought for a comprehensive archaeological study & management plan for the site. The study should include mapping & recording the obvious structures & relics, carrying out an archaeological investigation of the colliery site & the railway & making recommendations for the conservation of surviving relics & evidence, & for public interpretation & use of the site.*
>
> *An essential part of this project would be to recover from Freeman's Waterholes the top half of the important steel headframe (reputedly the first in Australia) and re-erect it on top of the half-headframe still at West Wallsend, with original or reconstructed back-stays. Organisations such as the Institution of Engineers Heritage Committee, the Newcastle Regional Museum, the Engineering Faculties*

[22] Heritage NSW, 'Former West Wallsend (No.1) Colliery', accessed 27 April 2022, https://www.hms.heritage.nsw.gov.au/App/Item/ViewItem?itemId=1910222.

of the Universities of Newcastle & NSW could be recruited in the project & possibly local engineering firms could be approached to contribute.[23]

3.3 Summary

There are two heritage listings relevant to these works, both of local significance on the Lake Macquarie 2014 LEP s170 heritage registers: *West Wallsend Valve House and Underground Reservoir* and *West Wallsend (No 1) Colliery*. The proposal involves decommissioning some of the current water infrastructure at the West Wallsend Reservoir, such as the 1980s pumping station building and other modern pump set will be demolished, but these items are not part of the heritage listing. The items of heritage significance, the valve house and reservoir, are planned to be retained. The West Wallsend Heritage Area is 100m to the south west and the next closest heritage item is 345 metres to the south west, both the conservation area and the next closest heritage item cannot be seen from the Project Area due to vegetation and topography.

[23] Heritage NSW.

4 Site Visit and Physical Assessment

Tessa Boer-Mah (Principal Heritage Consultant) and Lara Tooby (Heritage Consultant) undertook an inspection of the SoHI Study Area on 10 May 2022.

The SoHI Study Area consisted of the 1905 valve house and reservoir, 1980s pumping station building, ancillary infrastructure, and vegetated colliery area. Each of these elements are considered below. The elements associated with the valve house and water reservoir were in a cleared area with gravel road, with sclerophyll forest commencing on the edges of the buildings and structures (Plate 1). This area is accessible by a gravel (and degraded bitumen) roadway from Carrington Street (Plate 2). The vegetated colliery area is adjacent to this gravel pathway (Plate 3). No indications for archaeological deposit were observed during the site visit and archaeological deposit is not anticipated based on the background research.

4.1.1 LEP I207 Heritage Items—1900s Valve house and Reservoir

The underground reservoir which is heritage listed is beneath a 20m diameter earth mound with a flat top with safety fencing and an octagonal cast-iron vent is all that is visible of the underground reservoir (Plate 4). The valve house is located on the southern edge of the reservoir cap (Plate 5).

The valve house is a single-storey building made of orange/red bricks (potentially multiple types of local brick) laid in English Cross or Dutch Bond pattern (brick dimensions 233 x 110 x 15mm). The bricks have since been covered in light-green paint and graffiti. The gable roof is made of corrugated metal, and the building is situated on a concrete base. The door (on the eastern side of the building) is metal sheeted timber (not original) in the original arched timber frame, located on a sandstone base (Plate 6). Near the doorway is a depth marker, likely used to assist measuring the water level in the reservoir. The building consists of timber louvre vents 800mm H and 350mm W, with a brick arched head and raking sill of mortar are located on the north and south elevations to provide cross ventilation to the internal space. These are protected by metal mesh screens. The south side has a semi-circular headed concrete pipe encasement (measurements: 2.45m L x 1.33m H x 0.94m W) (Plate 7). Excluding this concrete structure, and concrete base (0.46m is visible out of the ground), the building is 2.93m L x >2.74m H (to the base of the vent) and 3.68m W.

4.1.2 LEP I207 Contributory equipment within a non-contributory enclosure—1980s Pumping Station Building and Modern Infrastructure

A single-story building housing the hydro-pneumatic pumping station was located 16m west of the reservoir and valve house (Plate 8). It is made of orange/red bricks laid in stretcher (running) bond pattern since covered in light green paint and graffiti (Plate 9). The skillion roof is made of corrugated metal. The building is set within an east to west slope with a small retaining wall and concrete landing on the southern side the metal entrance doors (Plate 10). There are two concrete open drains on the western side of the building (Plate 11). There are three vents on the western side of the building, 0.57m above the ground surface, and three vents on the eastern side of the building, 1.9m above the ground surface. The building is 5.86 L x 2.86 (eastern) – 3.35m (western) H and 6m W.

A pumping set (date unknown, other than being post-1950s infrastructure and likely later than the 1980s Pumping Station Building) is located 15m south of the Pumping Station Building, and 30m

south-west of the valve house. The infrastructure includes an accessible pit with removable chequer-plate covers and an adjacent pump set and electrical switchgear, and a pump set with stop valves to the pipework. Equipment is mounted on elevated concrete plinths (Plate 12 and 13).

4.1.3 LEP I220 Heritage (Archaeological) Area: Vegetated Colliery Area

The south-west of the SoHI Study Area consists of sclerophyll forests with a thick shrub understory which is part of the *West Wallsend (No 1) Colliery* (LEP I220) listing. Ground visibility was limited, but no historical relics (including structures or artefacts) associated with the old colliery were detected (Plate 14).

4.2 Summary

The inspection of the SoHI Study Area confirmed the description of the *West Wallsend Valve House and Underground Reservoir* (LEP I207) on the State Heritage Inventory. Specifically, the main element of the listing is the valve house and underground reservoir, while more modern (post 1950s) infrastructure has been added to the area over time. The addition of the modern infrastructure enhances the interpretive value of the area as representing the changing way in which freshwater is supplied to West Wallsend and its surrounds. However, the structure and allied infrastructure is obsolete, and the 1980s pumping station building is reported (by the client) to have has termite damage. The proposed decommissioning and removal of the modern structure provides an opportunity for onsite interpretation through a photographic survey and archival recording with supplementary descriptive text and thus the historic engineering heritage value of the site will be preserved.

A small portion of the *West Wallsend (No 1) Colliery* (LEP I220) is within the SoHI Study Area. None of the heritage features noted in the State Heritage Inventory (e.g., Extant evidence of the mining operations) were located in this area.

5 Assessment of Heritage Impact and Mitigation

This section provides an overview of significance, impact assessment and mitigation. The impact assessment includes the consideration of enhancement and detrimental impact to heritage item/s, as well as alternatives according to Heritage NSW's guideline *Statements of Heritage Impact.*

5.1 Significance Overview

The *West Wallsend Valve House and Underground Reservoir* (LEP I207) has heritage significance deriving from its role in facilitating the ongoing provision of municipal water to West Wallsend and surrounds. Key heritage elements are the valve house and underground reservoir, however additional buildings and infrastructure continue to convey the changing ways in which Hunter Water (and municipal water corporations) innovate ways of providing water to the local community.

The historical relics associated with the *West Wallsend (No 1) Colliery* (LEP I220) are not present within the SoHI Study Area on the basis of the site inspection, and instead are more likely to be located in the area directly north of West Wallsend.

5.2 DCP Consideration

The location of the SoHI Study Area with the *West Wallsend Valve House and Underground Reservoir* (LEP I207) is within an Environmental Conservation Zone (Zone C2). The area containing the *West Wallsend (No 1) Colliery* (LEP I220) is within a Public Recreation Zone (Zone RE1). The Lake Macquarie Development Control Plan (DCP) outlines heritage conditions relating to development in these zones. While the DCP does not strictly apply to the Review of Environmental factors, they are considered as part of the broader context of the assessment (Table 4).

Table 4. Consideration of the DCP (LMCC DCP 2014 Revision 27)

The impact of development on an item of heritage significance must be minimised by:	**Commentary**
i. Restricting the extent of development to that which is necessary;	Yes, the Proposal is only upgrading infrastructure where necessary.
ii. Conserving what is significant about the item;	Yes, both the valve house and the underground reservoir are being preserved.
iii. Clearly differentiating new development from the existing significant fabric	Yes, the Proposal uses modern form and materials and thus does not mimic the historic styles of the valve house and reservoir.
iv. Ensuring that development is of a scale, form, mass, proportion and finish that is sympathetic with the heritage item	Yes, the scale of the new infrastructure does not impose the valve house and reservoir,
v. Ensuring that development is sufficiently separated from the heritage item, so as not to compromise the existing level of visibility.	Yes, the Proposal is set away from the valve house and reservoir and does not impose on them.

5.3 Impact Assessment

5.3.1 Enhancement of Heritage Item/s

The following aspects of the Proposal respect or enhance the heritage significance of the item or conservation area for the following reasons.

The proposal enhances the Heritage significance of the item by upgrading the water infrastructure to ensure the original purpose of the heritage item continues in new upgraded forms.

The proposed decommissioning and removing the modern infrastructure will have a positive effect to the heritage of the items as it will show the items in their original landscape context. Archival recording will ensure that the historic engineering heritage value of the site will be preserved.

5.3.2 Detrimental Impact on Heritage Item/s

The following aspects of the Proposal could detrimentally impact on heritage significance.

The proposal will not include the removal or original fabric of the Heritage listed valve house and reservoir. Instead, will restore the historical known setting and its condition.

Without appropriate mitigation measures, the drill path through the area of *West Wallsend (No 1) Colliery* (LEP I220) and the demolition of the 1980s pumping station building could have a detrimental impact on the heritage values within the SoHI Study Area. However, with the mitigation measures in place (archival recording and implementation, unexpected finds procedure for relics, and heritage induction), the Proposal will not negatively affect the historic, social or aesthetic significance of the Heritage Items.

It is recommended that the removal of the 1980s building, which does not contain a fabric with heritage significance, be archivally recorded (see mitigation measures) to ensure that the operational evolution of water infrastructure to support the local population of Wallsend and Cameron Park can be preserved.

Filling the reservoir with sand is not a detrimental impact, as sand can easily and safely be removed, and will ensure that the reservoir does not become a safety risk to the general public.

Hunter Water aim to remove some of the watermains that join into the reservoir and valve house. The one known water pipe which contains heritage significance is the 1903/04 pipe line from Minmi. This has heritage significance as being evidence of the Walka pumping scheme being introduced to the area. Mitigation measures (of conserving and displaying the house next to the valve house) must be implemented if this pipe needs to be removed to connect new water infrastructure to the area.

Drilling for water infrastructure 0m to around 7m below ground in the curtilage of the *West Wallsend (No 1) Colliery* (LEP I220) is to proceed with caution (see mitigation measures), to ensure any unexpected archaeological relics are appropriately measured. With an unexpected finds procedure in place, there will be no detrimental effect on any archaeological evidence (relics) in the area.

5.3.3 Alternatives

The following sympathetic solutions have been considered and discounted for the following reasons.

The current water infrastructure in the SoHI Study Area would continue to be used (no upgrades or proposed work required) if it was able to meet the current demand of the growing local population around Cameron Park and West Wallsend. Historic elements are obsolete but seen as an important component of providing interpretation of the means of providing potable water to outlying areas such as West Wallsend. By upgrading the water infrastructure in the area, whilst maintaining the historic elements, the heritage values of the original water infrastructure are maintained. Therefore, this proposal is considered the most sympathetic solution to the issue of maintaining a reliable water supply to the local community.

5.3.4 Statement of Heritage Impact

By upgrading the water infrastructure in the area, yet retaining the heritage items of historical fabric (the reservoir and valve house), and archivally recording the post-1950s water infrastructure being removed, the heritage values of the original water infrastructure are maintained.

Some proposed drilling is within the area of the *West Wallsend (No 1) Colliery* (LEP I220) curtilage to create new pipes and replace old ones. Based on the site inspection is not expected that any archaeological features are preserved within the SoHI Study Area. Therefore, as long as an unexpected finds procedure is in place, the proposed drilling path will not have an impact to the heritage values of this heritage listing.

5.4 Mitigation Measures

Archival Recording

Archival recording of the post-1950s water infrastructure and building to be demolished should be undertaken, although these are not significant heritage fabric their presence informs the later use of the site and this usage is to be recorded. The archival recording should be undertaken in accordance with *Photographic Recording of Heritage Items Using Film or Digital Capture* (Heritage Office 1994). The archival recording report will be submitted to the local council library for public access, to the local council, and to Hunter Water

1903/04 Pipeline Unexpected Finds Procedure

If the 1903/04 pipeline from Minmi, considered to be a 'works' heritage item under the *Heritage Act 1977,* is required to be replaced by Hunter Water in order to complete the Proposal, some intact lengths should be retained next to the valve house, and interpretation signage installed. No heritage permit is required as the pipeline is not considered a 'relic' under the *Heritage Act* 1977.

Heritage Induction

A heritage induction is to be provided to all on-site personnel undertaking construction works so that they understand their obligations for protecting heritage under the *Heritage Act* 1977, which includes the reporting of archaeological or suspected archaeological material.

General Unexpected Finds Procedure

In the unlikely event archaeological, or suspected archaeological, material is uncovered during works, then works in that area are to cease and the area cordoned off. The material is to be inspected by a heritage consultant and works in that area are only to recommence once heritage clearance has been gained and/or mitigation and management measures implemented.

6 Conclusions and Recommendations

This assessment determined that the Proposal will have a negligible impact on the locally listed *West Wallsend Valve House and Underground Reservoir* (LEP I207) and *West Wallsend (No 1) Colliery* (LEP I220).

The Proposal can proceed in accordance with the following recommendations:

Recommendation 1

Archival recording of the post-1950s water infrastructure and building to be demolished should be undertaken, while this is not significant fabric, it contributes to an understanding of the site and thus is to be recorded. The archival recording should be undertaken in accordance with *Photographic Recording of Heritage Items Using Film or Digital Capture* (Heritage Office 1994). The archival recording report will be submitted to the local council library for public access, to the local council, and to Hunter Water.

Recommendation 2

If the 1903/04 pipeline from Minmi is required to be replaced by Hunter Water in order to complete the Proposal, some intact lengths should be retained next to the valve house, and interpretation signage installed. No heritage permit is required as the pipeline is not considered a 'relic' under the *Heritage Act* 1977.

Recommendation 3

A heritage induction is to be provided to all on-site personnel undertaking construction works so that they understand their obligations for protecting heritage under the *Heritage Act* 1977, which includes the reporting of archaeological or suspected archaeological material.

Recommendation 4

In the unlikely event archaeological, or suspected archaeological, material is uncovered during works, then works in that area are to cease and the area is to be cordoned off. The material is to be inspected by a heritage consultant and works in that area are only to recommence once heritage clearance has been gained and/or mitigation and management measures implemented.

Recommendation 5

Notification of the works involving the locally listed heritage items, which should include this report, should be sent to Lake Macquarie City Council.

7 References

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8 Plates

Plate 1. View north-west towards valve house and reservoir (building to the right of frame overlying the reservoir mound), the pumping station building (centre of frame) and the modern pumping station structure (left of frame).

Plate 2. View south along gravel (with some degraded bitumen) entrance to SoHI Study Area off Carrington Street.

Plate 3. View north-west from gravel path into the colliery area.

Plate 4. View north-west across the top of the underground reservoir, showing the octagonal cast-iron vent

Plate 5. View north towards the valve house on the south-western edge of the reservoir mound.

Plate 6. Eastern side of the valve house (facing west), showing entrance.

Plate 7. View of the southern side of the valve house (onto of the reservoir) facing south-east.

Plate 8. View north with view towards the pumping station building (left of frame) and valve house and reservoir (right of frame).

Plate 9. View south-west at the southern and western side of the pumping station building.

Plate 10. View of the southern side of the building, showing the concrete landing, metal entrance doors and a small retaining wall

Plate 11. View of the western side of the building, showing two concrete open drains and three vents, with a 30cm scale.

Plate 12. View north-east towards a pumping set, 15m south of the 1980s Pumping Station Building, and 30m south-west of the valve house.

Plate 13. View south at pumping set infrastructure, including a pit covered with a metal grate.

Plate 14. View south into forested West Wallsend (No 1) Colliery area that intersects with the SoHI Study Area.

Appendix G Noise and Vibration Assessment

tumney consulting
acoustic consultants
ABN 14-099-598-357

Acoustic Assessment

Cameron Park Reservoir

Prepared for

Hunter Water

Prepared by

Tumney Consulting Pty Ltd

Ray Tumney

Ref: 2022-004-401.1 Cameron Park Water Storage

Date June 2022

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Contents

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CONSTRUCTION NOISE IMPACT ASSESSMENT
CAMERON PARK RESERVOIR

1 INTRODUCTION

Tumney Consulting has been engaged by JM Environments to conduct a Construction Noise Impact assessment for the construction of a proposed reservoir and associated pipelines at Cameron Park and the decommissioning and demolition of the existing water storage facility at West Wallsend.

This report describes the methodology, results and findings of the assessment and makes recommendations for appropriate treatments to ensure compliance with the requirements of the NSW Interim Construction Noise Guide.

2 PROJECT DESCRIPTION

2.1 SITE DESCRIPTION

2.2 SCOPE OF WORKS

Stage 1 scope of works broadly entail:

- Construction of access and driveway off George Booth Drive from the Rural Fire Service driveway access to the reservoir site;
- Construction of a 3.25 ML Water Reservoir (the Reservoir) on Lot 1 DP 1156170;
- Connection of Reservoir to various existing water mains; and
- Decommissioning of existing Reservoir and West Wallsend 2 WPS on Lot 1 DP 923587.

The key features of the Proposal are shown in Cameron Park Reservoirs Concept Design REF Impact Drawing in Appendix A.

Stage 2 scope of works entail the construction of a 2nd 3.25 ML Water Reservoir.

This REF is concerned with Stage 1 only.

2.3 CONSTRUCTION ACTIVITIES

The key construction activities are listed below:

2.3.1 RESERVOIR CONSTRUCTION

The reservoir will be located within Lot 1 DP 1156170 as shown in Drawing 16258 Sheet 006 in Appendix B. Lot 12 DP1156170 will also be used for ancillary activities including site offices, ablution blocks and receival of construction materials. The reservoir will be above ground and constructed of concrete with a wall height of 7.8m and internal radius of 25.25m. Ancillary operational buildings and construction include:

- Pipework to receive and release potable water;
- A chlorination dosing facility;
- A pumping station;
- A reservoir mixing pump set;
- Access road from George Booth Drive to the Reservoir;
- Stormwater and reservoir overflow management system; and
- Security fencing.

2.3.1.1 RESERVOIR CONSTRUCTION ACTIVITIES

Construction activities include:

- Prepare management plans.
- Construct access road from George Booth Drive along a "paper road" lot.
- Clear grub all of Lot 1 DP 1156170 to situate infrastructure, approximately 3,600m^2.
- Establish a secure compound to take delivery of materials.
- Cut and/or fill the site to design levels;
- Construct the Reservoir and operational ancillary buildings and constructions.

2.3.2 WEST WALLSEND WPS TO RESERVOIR PIPE ALIGNMENT

2.3.2.1 PRECONSTRUCTION ACTIVITIES

The heritage listed West Wallsend Valve House and Underground Reservoir will be isolated from construction activities using temporary fencing and "no go zone' signage. The non-heritage listed assets, a 1980s pumps house and modern pump set located to the south west of the West Wallsend Valve House and Underground Reservoir (refer to Section 6.9)

will be demolished and removed from site. If the heritage listed water pipe, 1903/04 pipe line from Minmi, is required to removed or be drilled through, then an intact section must be stored within the heritage protection fencing for future display.

A horizontal directional drilling (HDD) compound will be established in an area disturbed by non-heritage item demolition. The compound be securely fenced and will be used to store drill rig(s), drill rods, other drilling equipment and consumables.

2.3.2.2 Construction Activities

HDD drilling involve the use of drilling fluids and will generate drill spoil in the form of a slurry with a drill fluid:soil ratio of 2.5:1. HDD will be undertaken from the West Wallsend WPS to the proposed reservoir site. HDD hole will start at the surface and is expected to reach a maximum depth of 10.502m below ground surface at a distance of 72.922m from the entry hole. The HDD hole is designed to be approximately 397.85m long.

Mains pipeline, 450m, will be installed between the Reservoir and the West Wallsend WPS.

2.3.3 Reservoir to Floresta Crescent and Reservoir to Cameron Park Drive Pipe Alignments

The Reservoir to Floresta Crescent and Reservoir to Cameron Park Drive Pipe Alignments are proposed to be installed by trenching existing access tracks.

2.3.3.1 Construction Activities

The pipeline alignment was designed for two parallel pipelines with one pipeline planned to be installed at this stage. The pipeline alignment is 8m wide. The pipeline trench will be excavated, and the spoil will be stored alongside the trench excavation for use as backfill.

2.4 Operational requirements

Once commissioned, the Reservoir will operate to store and gravity feed potable water via the HWC network.

Power will be supplied via connection to the established electricity supply grid.

2.5 TIMING AND STAGING

2.5.1 CONSTRUCTION TIMING

Construction is expected to commence from January 2023 and continue to January 2025.

Hours of work would be from 7am-6pm, Monday to Friday and 8am-1pm Saturdays. No construction activities will be undertaken on Sundays or Public Holidays.

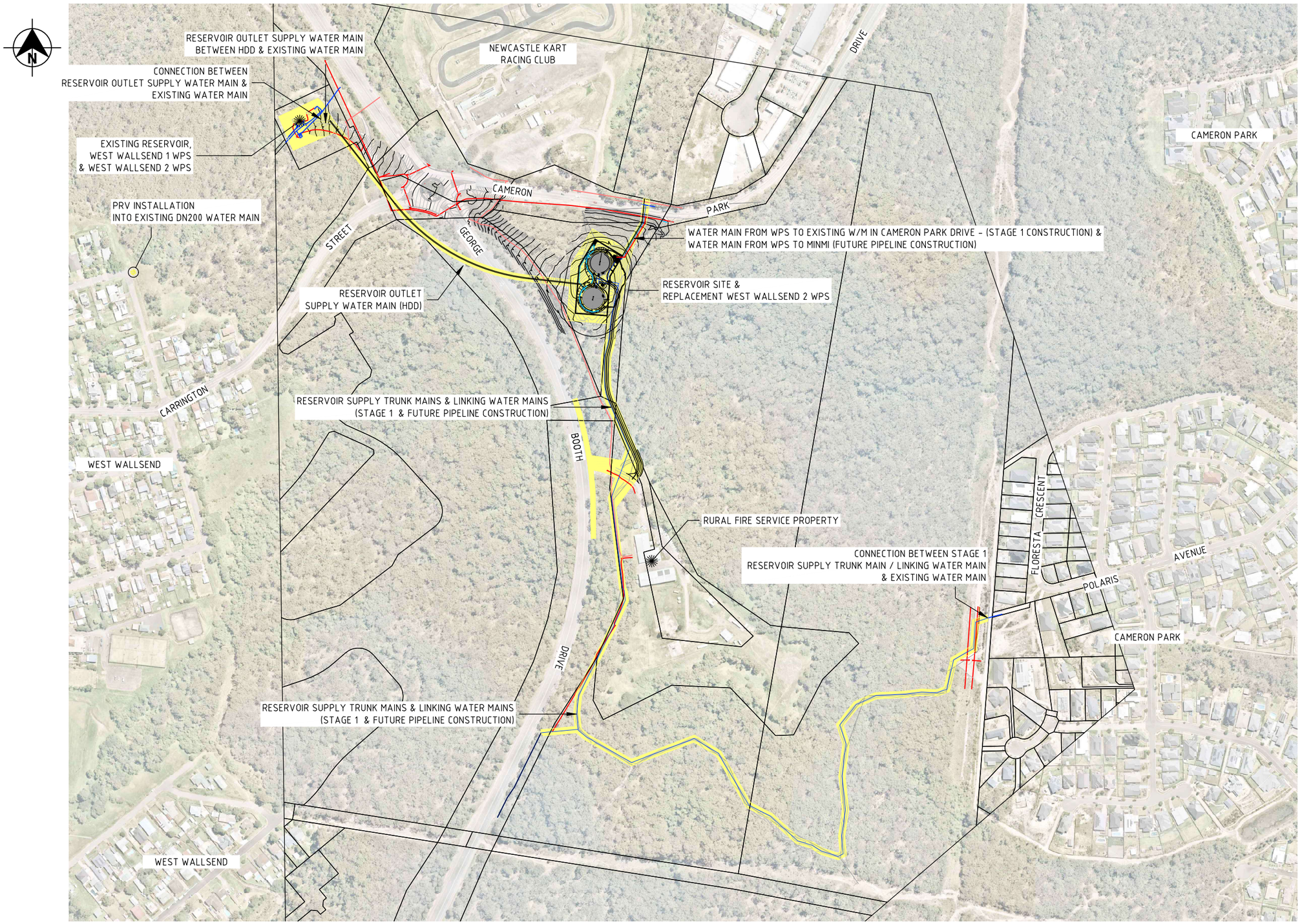
2.5.2 OPERATION

The Reservoir will operate continuously for 24hrs per day.

2.6 ANCILLARY FACILITIES

The exact location of the compounds has not been set. Site compounds will be located within the Reservoir site on Lot 1 DP 11561170 and HDD borehole entry location on Lot 1 DP923587 in areas that do not require additional clearing, ground disturbance or demolition of existing structures that are not planned to be demolished.

The site location is shown in the map and aerial image of the surrounding area, in Figure 1.



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- OHP — EXISTING ELECTRICITY (O/H)
- LV — EXISTING ELECTRICITY (U/G)
- OFC — EXISTING TELECOMMUNICATIONS (OFC)
- SW — EXISTING STORMWATER
- IMPACT AREA

Figure 1
Project Area

No.	REVISION DETAILS	DWN	DATE
A	INFORMATION	CT	21/06/22

CONSULTANT DETAILS:
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HEAD OFFICE
19 SPIT ISLAND CLOSE
MAYFIELD WEST NSW 2304
T +61 2 4941 5000
info@hunterh2o.com.au
Hunter H2O Holdings Pty Limited
ABN 16 602 201 552

CONSULT. REFERENCE No. 10156

HUNTER WATER

DESIGNED: –	DATE: –	COMPANY: –	
DRAWN: –	DATE: –	COMPANY: –	
CHECKED: –	DATE: –	COMPANY: –	
APPROVED: –	DATE: –	COMPANY: –	

TITLE:
CS1175 - SR00156
CAMERON PARK RESERVOIRS
WR-CRE-001 RES AND WR-CPE-002 RES
CONCEPT DESIGN
'REF IMPACT AREA'

SIZE:	SCALE:	INDEX No.	DRAWING No.	SHEET	REV No.
A3	1:5000		–	–	A

VERSION 4

Plot Date: 22/06/22 - 08:49 Cad File: P:\HWC\10000 HWC Partnership\10156 Cameron Park Reservoir\2. Tasks\4. Survey and Services Location\2. Current Working\(REF IMPACT AREA).dwg

3 NOISE SENSITIVE RECIEVERS

The closest Noise Sensitive Receivers that may be affected by decommissioning and demolition of the existing West Wallsend water storage are 300 metres to the west of the site and facility are not expected to receive noise from construction activities above 50 dB(A). The daytime background noise level in that area is dominated by traffic from George Booth Drive and the Pacific Motorway and has been measured at 45 dB(A) and so it is unlikely sound levels from the work will approach the Target Construction Noise level of 55dB(A) for that area.

4 BACKGROUND SOUND LEVELS

Background sound levels for each of the sensitive receiver locations were determined by attended survey on the 24th of April 2022. The locations for the measurements are shown in Figure 2.

The levels measured are:-

Location 1 West Wallsend	45dB(A)
Location 2 RFS Headquarters	55 dB(A)
Location 2 Florista Crescent	35 dB(A)

Figure 2 Location of Background Sound Level Measurements

5 CONSTRUCTION NOISE

5.1.1 CONSTRUCTION SOUND LEVELS

The construction noise assessment in this report has been conducted as a qualitative assessment in accordance with the NSW ICNG by examining the significant plant items and activities that have the potential to cause a noise impact on nearby neighbours.

Demolition and Construction of the water storages and pipeline will involve the use of a variety of plant and equipment.

The equipment items that have the potential to cause significant noise impact are listed in Table 1, 2 and 3 below, based on the works that are expected to occur in each area, along with the A-Weighted Sound Power Levels determined from the DEFRA Construction Equipment Noise Database 2005 and the predicted received sound level at the nearest residence.

Table 1 Construction Noise Levels from Various Equipment West Wallsend

Activity	Plant Item	A-Weighted SWL	SPL at Nearest Receiver 300 m	Construction Noise Management Level
Site Prep	20 tonne Excavator	103	45.5	55 dB(A)
	Road Truck	108	50.5	
Concrete Demolition	40 Tonne Excavator with Hydraulic Rock Breaker	120	62.5	
	20 Tonne Excavator	103	45.5	
	Backhoe / Skid Steer Loader	95	37.5	
	Concrete Agi Trucks with Concrete Pump	103	45.5	
Pipe Line Trenching and Laying	20 tonne Excavator	103	45.5	
	Backhoe / Skid Steer Loader	95	37.5	
	Roller 4 t (No Vibration)	102	44.5	
	Concrete Agi Trucks with Concrete Pump	103	45.5	
Finishing	Hand tools	100 on Average	42.5	

Table 2 Construction Noise Levels from Various Equipment RFS Headquarters

Activity	Plant Item	A-Weighted SWL	SPL at Nearest Receiver 25 m	Construction Noise Management Level
Site Prep	20 tonne Excavator	103	67	70dB(A)
	Road Truck	108	72	
Trenching and Pipelaying	40 Tonne Excavator with Hydraulic Rock Breaker	120	84	
	20 Tonne Excavator	103	67	
	Backhoe / Skid Steer Loader	95	59	
	Concrete Agi Trucks with Concrete Pump	103	67	
Finishing	Hand tools	100 on Average	64	

Table 3 Construction Noise Levels from Various Equipment Florista Crescent

Activity	Plant Item	A-Weighted SWL	SPL at Nearest Receiver 50 m	Construction Noise Management Level
Site Prep	20 tonne Excavator	103	61	45 dB(A)
	Road Truck	108	66	
Pipe Line Trenching and Laying	20 Tonne Excavator	103	61	
	Backhoe / Skid Steer Loader	95	53	
	Concrete Agi Trucks with Concrete Pump	103	61	
Finishing	Hand tools	100 on Average	58	

The evaluation of construction noise impacts shows that there will be times during the project when neighbours may be noise affected but not highly noise affected (ie sound levels above 75 dB(A)). Although there is a possibility that if rock breaking is required close to the RFS offices on Alignment Option 1 then that building may be Highly Noise Affected for a period. A construction noise management strategy should be put in place as outlined in Appendix A of this report.

In general construction noise levels within adjacent dwellings when windows and doors are closed will be below 45 dB(A) which is consistent with the recommended internal sound levels for those dwellings most affected by construction activities.

5.1.2 Construction Vibration

None of the proposed work areas that may generate construction vibration are close enough to buildings that there is a risk of adverse impacts arising from vibration caused by construction activities.

6 RECOMMENDATIONS

The predicted sound pressure levels at the worst potentially affected receivers may at times exceed the Construction Noise Management Level for that area.

This may occur when machinery is working within 150 meters of residences at Florista Close.

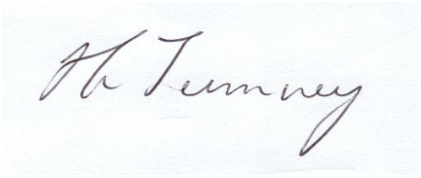
The Highly Noise Affected Management Level may be exceeded when rock breaking demolition with a Hydraulic hammer is conducted within 80 metres of an affected property.

During these times community Liaison activities should be put in place to minimise disruption to the community.

7 CONCLUSION

Thank you for the opportunity to provide this assessment, please do not hesitate to contact the undersigned if you have any questions regarding this or any other acoustic or environmental matter.

Yours Sincerely
Tumney Consulting



Ray Tumney BEng (Mech), MEnv Stud, MAAS.
Principal Acoustic Engineer

Date 28 June 2022

8 REFERENCES

[1] Australian Standard 1055.1 – 1997 Acoustics – Description and Measurement of Environmental Noise – General Procedures.

[2] Environment Protection Authority, NSW Industrial Noise Policy (INP), 2000.

[3] Protection of the Environment Operations Act (POEO Act), 1997.

9 TERMS AND DEFINITIONS

dB(A) ..... Unit of sound pressure level, modified by the A-weighting network to represent the sensitivity of the human ear.

Gradient Wind ..... Gradient wind is the regional wind determined by synoptic factors (high and low-pressure systems), and may originate from any direction.

SPL ..... Sound Pressure Level (SPL), the incremental variation of sound pressure from the reference pressure level, 20 µPa, expressed in decibels.

SWL (L_W)..... Sound Power Level (SWL) of a noise sources per unit time expressed in decibels from reference level W_O of 10^{-12} W.

L_X ..... Statistical noise descriptor. Where (x) represents the percentage of the time for which the specified noise level is exceeded.

L_{eq} ..... Equivalent continuous noise level averaged over time on an equivalent energy basis.

L_1 ..... Average Peak Noise Level in a measurement period.

L_{10} ..... Average Maximum Noise Level in a measurement period.

L_{90} ..... Average Minimum Noise Level in a measurement period.

L_{max} ..... Maximum Noise Level in a measurement period.

Background Noise Level..... Noise level determined for planning purposes as the one tenth percentile of the ambient L_{A90} noise levels.

P_O ..... Reference Sound Pressure, 20 µPa, for the calculation of SPL in decibels.

W_O ..... Reference Sound Power, 10^{-12} W, for the calculation of SWL in decibels.

Appendix A Construction Noise and Vibration Management

MANAGEMENT OF CONSTRUCTION SOUND AND VIBRATION

General

It is the nature of construction noise and vibration that the levels are dependent on the particular work that is being conducted at any particular time and the location of that work with respect to Noise Sensitive Receivers. This often leads to management of noise and vibration "by complaint". This may mean that work continues, with or without monitoring being conducted, until complaints arise from an affected receptor. Generally this method has been found to be unsatisfactory in the past as allowing complaints to arise creates a situation that is more difficult to manage than it might otherwise be.

In order to manage construction noise impacts effectively specific high noise level activities during site preparation and foundation construction have been identified in the acoustic report.

NOISE MANAGEMENT

Predicted Noise Levels

Noise levels are predicted to generally remain below the "Highly Noise Affected Levels" for most of the works. However, if rock breaking or other high noise generating activity is to occur within 80 meters of residences or other affected building then proactive community engagement should be applied to minimise the impacts of that activity.

Sound and Vibration Monitoring

It is unlikely that there will be a requirement for sound or vibration monitoring at this site, however, should persistent complaint arise then an appropriately qualified Acoustic Consultant should be engaged to assess the sound or vibration levels in accordance with the NSW Interim Construction Noise Guide and to recommend remedial action as required.

COMMUNITY INTERFACE AND COMPLAINT MANAGEMENT

Proactive Community Noise Management

Most of the activities listed in this acoustic assessment will occur in the region of an affected residence for a short period as the construction program moves along the alignment path. The overall scope of site preparation and foundations and demolition of the existing facility taking of the order of two to three weeks each in total. Each of the activities will affect different receivers with noise levels varying according to the particular works in a particular location at the time.

When works that are likely to exceed either noise management level and in particular the Highly noise affected level are to occur within 80 meters of a neighbouring dwelling the site supervisor should arrange for notification of residents that noisy activities will be occurring and provide an estimated duration of the noise events.

Residents may then choose to arrange for shopping or other activities out of the house for a short period.

Community Contact

A complaints contact number shall be posted on a notice board at the entry to the site. The writing on the board is to be clearly visible and easily read from vehicle on Bridge Street and will:-

1. identify the nominated contact and their position and
2. provide a Daytime contact telephone number
3. Provide instructions of what to do in the event that someone has a complaint regarding the construction operations.

Complaint Log

A complaint log will be established on site to record the following information:-

1. Date and Time of Complaint
2. Location and contact Details of Complainant
3. Nature of the Complaint
4. Corrective Action Implemented

The complaints log will be under the control of the Site supervisor at all times and will be reviewed weekly by the Project Manager.

In the event that complaint is received the project manager will be advised immediately and they will determine the appropriate action in consultation with the project supervisor in accordance with the action plans for noise and vibration management above. The project manager will advise the complainant of the proposed actions and will monitor the situation until the matter has been satisfactorily resolved.