Sent: 17/10/2022 11:44:05 AM
Subject: RE: 10-12 Boondah Rd, Warriewood PEX2022/0001
Attachments: Notes - meeting with applicant 21.9.22.pdf; Calibre Stormwater Management Memo Ocotber 2022.pdf; 85749.00.R.004.Rev0 Groundwater Levels.pdf; Travers Ecology Boondah Rd Warriewood memo to Council October 2022.pdf; Boondah Road -0102 SITEPLAN October 2022.pdf;

Hi Paula,

In response to the matters raised in our meeting on 21 September 2022 (your notes attached) we submit and the following information and attachments for further consideration by Council with regard to our Rezoning Request application. We will upload these items to the Planning Portal and we rely upon this information and the emails below as additional information to support and amend (where relevant) the Rezoning Request.

- **Please find attached a memo from our water engineers Calibre Consulting (dated 10 October 2022)** regarding earthworks, stormwater and groundwater levels, to supplement the Water Management Report (Rev4 2/6/22) already submitted in support of the Rezoning Request. The memo;
    - Confirms that on the basis of several historical groundwater well measurements (in 2016 and 2019) on 12 Boondah Road that it is unlikely there will be any impact to the groundwater levels or flows into Warriewood Wetlands due to proposed earthworks and therefore groundwater volumes through the site into the Wetlands will be preserved. A Douglas Partners memo regarding the groundwater measurement results are also attached. It should be noted that we sought to take new groundwater measurements just last week, but the existing rural users had obstructed the groundwater wells with soil and piles of chopped wood and hence these measurements were not able to be taken. Naturally detailed groundwater level measurements can be taken at DA stage to confirm the preliminary conclusions.
    - Confirms all earthworks levels comply with council flood planning levels as advised to us by Council.
    - Presents preliminary MUSIC contaminant modelling for site stormwater runoff that confirms runoff either into the Warriewood Wetlands or council drain system can comply with Council pollutant reduction targets and I can confirm that sufficient area is available on site for treatment options.
    - Confirms that overland flow volumes, being stormwater from the site (mentioned above) and flows over the site from the eastern side of Boondah Road will be preserved post development (in addition to the preservation of groundwater flows mentioned above).
    - Confirms that the proposed flooding strategy complies with the Pittwater DCP C6.1 requirements, requirements that were advised to us in both the Pre-Lodgment minutes for the application and also as advised by Council's Floodplain Management Officer to our flood engineer (see correspondence attached 25 January 2022) whereby filling of land will only be permitted if it can be demonstrated that there is no adverse impacts to the site or surrounding properties. The measure of adverse impact is based on afflux modelling and the acceptable afflux levels for various flood events were also advised to us by council staff. The only small afflux exceedance (approx 25mm or 2.5cm) in the Sydney Water treatment plant and buffer next to Narrabeen Creek due to Boondah Road being raised is, 1) a non-habitable low lying area, 2) may be mitigated by placing culverts or pipes under the raised up road which reestablishes flows to the wetland and results in the maximum afflux from this proposal being approximately 15mm or 1.5cm and less than 20mm which is the Council nominated acceptable afflux and 3) in an area already flooded impacted (already medium and high flood risk).
    - The memo also explains why the modelled post development afflux around the site and in the floodplain is so low and why cumulative impacts from this proposal and future developments from

loss of flood storage is not a concern primarily because, 1) the site is very low on the floodplain any impact will primarily be spread over the very large downstream and adjacent portion of the floodplain of 300Ha (as evidenced by the very low afflux results based on Councils flood model) and not on other developable properties and 2) there is very little remaining land zoned for development in the floodplain.
    - If still a concern, perhaps council can be more specific around "cumulative impacts of developments" and their ideas on the future development that may occur at some point and our engineers can use any of the endorsed Council flood models to analyze the impacts together with the council engineers?
- **Please find attached a memo from our bushfire and ecology consultant Travers (dated 12 October 2022).** The memo;
    - Invites Council to provide formal comment on the final BCAR application that also form part of the Rezoning Request.
    - Summarizes the updates to the BCAR in response to the EHG comments so far received.
    - **Confirms a revision to the C2 zoning boundary of this proposal to encompass all of the mapped wetland on the Coastal Wetlands and Littoral Rainforest Area Map . Please take this email as an amendment to the Rezoning Request. A formal revised Zoning Map may be provided to Council if required now or at later stage. We trust the intent of the revised C2 zone boundary is clearly defined in Attachment 1 to the memo.**
    - Confirms significant landscape planting is permissible with the Asset Protection Zone in accordance with RFS *Planning for Bushfire Protection* (IPA requirements).
    - Confirms that the 0.23Ha of remnant trees (27 trees with no understory or mid storey vegetation) from the remnant and highly impacted Bangalay Sand Forest will be removed and will be replaced by Bangaly Sand Forest species covering approximately 0.5Ha of planting comprising 44 trees, including shrubs and ground layers not present today and providing an improved floristic structure. The proposal will therefore provide a net positive outcome of an additional 0.27Ha and 17 trees of Bangalay Sand Forest on the site.
    - As mentioned we are also happy to discuss contributions to augmentation of local biodiversity EEC as further offset of impacts.
- **Please find attached revised Buchan Group site plan (AMP-0102 Rev3 dated 5/10/22)** demonstrating how the perimeter road may be moved out of the 15m landscape buffer whilst still maintain appropriate gradients on the internal roads.
- **I also hereby confirm that we are happy to accept an LEP control that limits the Height of Buildings to "2 story plus attic", in addition to the 15m height limit provisions already proposed. Please take this email as an amendment to the Rezoning Request.**
- We would also appreciate copies of any internal and external referrals that Council may have in its possession regarding the Rezoning Request as discussed. We note the SES has been sent a previous Calibre response to their submission dated 31 August 2022 and ask if any further response has been received from the SES?

Notwithstanding the above request for referrals, we are happy for you to finalize the assessment and report to Council based on this email unless there are any further matters that Council wishes to raise with us at this time?

Regards,

Dan Maurici
Senior Development Manager
Henroth Group
Suite 604, Eastpoint Tower,
Level 6, 180 Ocean Street, Edgecliff NSW 2027
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T: (02) 9302 5333 **F:** (02) 9302 5322
E: dan@henroth.com.au

From: Paula Moretti
Sent: 30 September, 2022 3:05 PM
To: Scott Barwick ; Daniel Maurici
Cc: Phil Jemison ; Andrew Pigott ; Robert Blackall ; Brendan Smith
Subject: RE: 10-12 Boondah Rd, Warriewood PEX2022/0001

Hi Scott,

Thank you for that clarification.

Calibre's response has been forwarded to the SES.

In relation to the revised BCAR and CMIP, it was discussed at our meeting that a summary of the revisions and their substance would be useful.

Kind regards,

Paula Moretti
Principal Planner

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northern beaches council

From: Scott Barwick <SBarwick@sjb.com.au>
Sent: Thursday, 29 September 2022 4:57 PM
To: Paula Moretti <Paula.Moretti@northernbeaches.nsw.gov.au>; Daniel Maurici <dan@henroth.com.au>
Cc: Phil Jemison <Phil.Jemison@northernbeaches.nsw.gov.au>; Andrew Pigott <Andrew.Pigott@northernbeaches.nsw.gov.au>; Amanda Clarke <Amanda.Clarke@northernbeaches.nsw.gov.au>
Subject: RE: 10-12 Boondah Rd, Warriewood PEX2022/0001

Paula,

Further to Dan's email and our meeting last week I can confirm that I have uploaded to the Portal the revised BCAR and CMIP which the applicant seeks to rely upon as well as the response to the matters raised by the SES prepared by Calibre consulting.

As discussed at the meeting the intention for the land to be zoned C2 to remain in private ownership and be in the long term be managed by the future land owners either via a body corporate or community association arrangement.

The other matters raised are being worked through and as discussed at the meeting we are appreciative of the opportunity to engage with Council and in that regard we continue to be keen to work with Council to try and narrow the issues for a mutually acceptable outcome rather than being driven by the 90 day performance deadline.

Regards

Scott Barwick
Director

SJB Planning
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Surry Hills NSW 2010
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Caring for the lands, waters, and skies of the Country on which our projects visit.

From: Paula Moretti <Paula.Moretti@northernbeaches.nsw.gov.au>
Sent: Thursday, 29 September 2022 2:49 PM
To: Daniel Maurici <dan@henroth.com.au>
Cc: Phil Jemison <Phil.Jemison@northernbeaches.nsw.gov.au>; Andrew Pigott <Andrew.Pigott@northernbeaches.nsw.gov.au>; Amanda Clarke <Amanda.Clarke@northernbeaches.nsw.gov.au>; Scott Barwick <SBarwick@sjb.com.au>
Subject: CAUTION POSSIBLE SPAM: RE: 10-12 Boondah Rd, Warriewood PEX2022/0001

Hi Dan,

The issues identified in relation to biodiversity impact and flood hazard are a consideration for Council in weighing up the proposal's consistency with the strategic planning framework, along with the provision of affordable housing and whether or not the argument of need is sufficient to overcome potential adverse impacts.

Kind regards,

Paula Moretti
Principal Planner

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northern beaches council

From: Daniel Maurici <dan@henroth.com.au>
Sent: Thursday, 29 September 2022 2:11 PM
To: Paula Moretti <Paula.Moretti@northernbeaches.nsw.gov.au>
Cc: Phil Jemison <Phil.Jemison@northernbeaches.nsw.gov.au>; Andrew Pigott <Andrew.Pigott@northernbeaches.nsw.gov.au>; Amanda Clarke <Amanda.Clarke@northernbeaches.nsw.gov.au>; Scott Barwick <sbarwick@sjb.com.au>
Subject: RE: 10-12 Boondah Rd, Warriewood PEX2022/0001

Hi Paula,

Thanks. Based on Scott's and my notes from the meeting there were no issues raised around the strategic planning framework (District Plans, LSPS, LHS, open space plans, s7.11 plans etc) so we take it that council has not objections to the Rezoning Request on strategic planning grounds. Please confirm?

Regards,

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From: Paula Moretti <Paula.Moretti@northernbeaches.nsw.gov.au>
Sent: 28 September, 2022 4:17 PM
To: Daniel Maurici <dan@henroth.com.au>
Cc: Phil Jemison <Phil.Jemison@northernbeaches.nsw.gov.au>; Andrew Pigott <Andrew.Pigott@northernbeaches.nsw.gov.au>; Amanda Clarke <Amanda.Clarke@northernbeaches.nsw.gov.au>; Scott Barwick <sbarwick@sjb.com.au>
Subject: RE: 10-12 Boondah Rd, Warriewood PEX2022/0001

Hi Dan,

Another meeting is not necessary at this stage as the main strategic planning matters were covered in our meeting last week.

Unless there is something specific you want to raise that was not discussed last week, we look forward to receiving the further technical information.

Kind regards,

Paula Moretti
Principal Planner

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northern beaches council

From: Daniel Maurici <dan@henroth.com.au>
Sent: Wednesday, 28 September 2022 11:06 AM
To: Paula Moretti <Paula.Moretti@northernbeaches.nsw.gov.au>
Cc: Phil Jemison <Phil.Jemison@northernbeaches.nsw.gov.au>; Andrew Pigott <Andrew.Pigott@northernbeaches.nsw.gov.au>; Amanda Clarke <Amanda.Clarke@northernbeaches.nsw.gov.au>; Scott Barwick <sbarwick@sjb.com.au>
Subject: RE: 10-12 Boondah Rd, Warriewood PEX2022/0001

Hi Paula,

Thanks for meeting with us last week to discuss the proposal.

We appreciate the opportunity to collaborate with Council to resolve as many issues as possible and request that the assessment timeframes are relaxed so that this process may continue.

We are putting together the extra technical information you have requested and will endeavor to provide that back to you, most likely late next week.

In the meantime, it occurred to me that we did not discuss any strategic planning comments you may have and so we request a meeting to discuss this with yourself and presumably Andrew. Can you please provide some times for this perhaps next week?

Regards,

Dan Maurici
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From: Paula Moretti <Paula.Moretti@northernbeaches.nsw.gov.au>
Sent: 9 September, 2022 4:46 PM
To: Daniel Maurici <dan@henroth.com.au>
Cc: Phil Jemison <Phil.Jemison@northernbeaches.nsw.gov.au>; Andrew Pigott <Andrew.Pigott@northernbeaches.nsw.gov.au>; Amanda Clarke <Amanda.Clarke@northernbeaches.nsw.gov.au>
Subject: RE: 10-12 Boondah Rd, Warriewood PEX2022/0001

Hi Dan,

Apologies for the delay, I am waiting to confirm with management at this end.

I can see potential availability on Wed 21 Sept at 2pm. I have forwarded your request to Andrew Pigott.

As I won't be back in the office until Wednesday next week, could you please follow up with Andrew's EA on Monday Amanda.Clarke@northernbeaches.nsw.gov.au.

Kind regards,

Paula Moretti
Principal Planner

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northern beaches council

From: Daniel Maurici <dan@henroth.com.au>
Sent: Friday, 9 September 2022 4:39 PM
To: Paula Moretti <Paula.Moretti@northernbeaches.nsw.gov.au>
Cc: Scott Barwick <sbarwick@sjb.com.au>; Phil Jemison <Phil.Jemison@northernbeaches.nsw.gov.au>; Louise Kerr <Louise.Kerr@northernbeaches.nsw.gov.au>
Subject: RE: 10-12 Boondah Rd, Warriewood PEX2022/0001
Importance: High

Hi Paula,

Please advise asap?

Regards,

Dan Maurici
Senior Development Manager
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E: dan@henroth.com.au

From: Daniel Maurici
Sent: 8 September, 2022 3:07 PM
To: Paula Moretti <Paula.Moretti@northernbeaches.nsw.gov.au>
Cc: Scott Barwick <sbarwick@sjb.com.au>; Phil Jemison <Phil.Jemison@northernbeaches.nsw.gov.au>; Louise Kerr <Louise.Kerr@northernbeaches.nsw.gov.au>
Subject: RE: 10-12 Boondah Rd, Warriewood PEX2022/0001

Hi Paula,

Thanks for the SES letter. We will review in detail and note that the SES response relates entirely to the Water

Management Report provided by Calibre.

Unfortunately our civil engineer from Calibre is not available for our meeting next Wednesday and we feel that his attendance is necessary so he may discuss the SES letter, any further information or scheme amendments required to address the letter and any other implications with your flood officers.

Accordingly we request the meeting is reschedule to the following week and that you suggest some suitable times?

Regards,

Dan Maurici
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From: Paula Moretti <Paula.Moretti@northernbeaches.nsw.gov.au>
Sent: 8 September, 2022 11:50 AM
To: Daniel Maurici <dan@henroth.com.au>
Cc: Scott Barwick <sbarwick@sjb.com.au>; Phil Jemison <Phil.Jemison@northernbeaches.nsw.gov.au>; Louise Kerr <Louise.Kerr@northernbeaches.nsw.gov.au>
Subject: 10-12 Boondah Rd, Warriewood PEX2022/0001

Hi Dan,

Ahead of our meeting next week, please find attached a preliminary response from the NSW SES.

The response raises some fundamental concerns with the proposal. We can discuss the implications of this next week.

Kind regards,

Paula Moretti
Principal Planner

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PEX2022/0001 Notes from Meeting with Applicant 21 September 2022

Council: Andrew Pigott, Phil Jemison, Paula Moretti, Patrick Stuart, Brendan Smith, Robert Blackall

Applicant: Dan Maurici, Scott Barwick (SJB), Troy Eyles (Calibre), George Plunkett (Travers)

Flooding

- Council has forwarded Calibre's memo to SES; agree can clarify certain aspects (e.g. Boondah Rd finished level 1% + climate change to the north and Calibre's modelling accounts for this, 6 Jacksons Rd is not part of site, and not a flash flooding situation) SES resources are stretched, may not get a quick response.
- SES does not support shelter in place or private alarm systems (will their fundamental position on this change once they know there is a 1%AEP route for evacuation?)
- where is the cut proposed? Council needs to see how balance of cut/fill can be achieved to demonstrate no net loss of flood storage. Site layout plan does not appear to leave room for areas of cut.
- Calibre focussed more on modelling to demonstrate impacts are within acceptable levels
- Not appropriate to rely on other properties to accommodate flood storage lost from the site. DCP wording is no net loss and/or no adverse impacts on other properties, however Council needs to consider cumulative impact given the considerable amount of fill required and the possibility of other sites seeking to achieve developable areas through similar earthworks.

Water Quality

- what is the concept for water quality management e.g. detention basin ? this is a DA detail, but the site layout doesn't leave much spare and Council needs to know that it is achievable
- Calibre – proprietary device or something else will be provided, they will do some basic planning and send further detail to demonstrate it can be made to work
- water management must also address potential impacts on groundwater dependent ecosystems – Henroth has determined cut will not reach groundwater levels and there will be no change to overland flow to wetland – will provide further detail

Biodiversity / Wetland

- pull back development, including any earthworks, from mapped Coastal Wetland - ground truthing may show variance between the vegetation on site and what is mapped by State Gov but any development in mapped area will be designated development requiring an EIS
- proposed C2 is not proof of 'avoid and minimise' as development would not be allowed there
- C2 areas zoning could trigger acquisition, practice note requires Council to nominate acquiring authority when rezoning to C2
- Henroth's intention is C2 stays in private ownership, owned and maintained as part of community title
- Bangalay Sand Forest (EEC) full extent to be removed; legislation provides an avenue to offset through payments, but this is hard to justify at a local level; likely any offset payments will not benefit biodiversity on Northern Beaches
- why chose BCAR as an approach to this site? to have the highest level of scrutiny with EHG
- Travers to provide summary of revisions to BCAR and CMIP in response to EHG feedback

- Henroth happy to discuss how they could contribute to local augmentation of biodiversity – can they enhance the remaining 50% extent of the EEC; this is not a typical approach for Council
- can Council make the internal referral responses available? t.b.c.
- DCP requires 15m landscaped buffer to wetland – how to reconcile this with APZ requirements and internal road – road serves dual function, provide a defendable edge for fire-fighting, and a break for management of weed escape etc; road alignment to be reviewed

Building Height

- why seeking 15m for townhouses 2 storeys + attic ? questions will be raised as previous PP sought same height limit for 4 storey apartment buildings – finished level for townhouses will be constant across site due to flood requirements, it is only at southern end of development where existing site levels are lowest, that 15m may be required – Henroth to consider LEP provisions to limit development to 2 storeys + attic, to provide assurance about proposed height limit

Affordable Housing

- Council requires 10% dedicated in perpetuity as affordable housing and PP must include mechanism to include site in AH scheme - refer to PP in Narrabeen (cnr Pittwater & Albert Rd)

Timing

- Council looking to LPP 19 Oct in line with 90day deadline; will need confirmation from applicant that assessment time is extended to allow for further material to be submitted and reviewed

Memorandum

Date:	14 October 2022	**Pages:**	17
To:	Dan Maurici	**Copy:**	Rev00
From:	Troy Eyles	**Ref:**	21-000093 – 10-12 Boondah Road, Warriewood

Subject: **10 – 12 Boondah Road, Warriewood - Stormwater and Flooding Management Strategy Memo**

10 – 12 Boondah Road is located within the Northern Beaches Council. Situated within the Warriewood Valley Land Release Area, the site comprises a total of 2.04 Ha, and is currently used for agricultural purposes.

Upon project completion, the transformation of the site will accommodate approximately 42 new townhouse dwellings, a children's playground, and pedestrian walkways. Calibre Professional Services (NSW) Pty Ltd has been engaged to prepare documentation to support the stormwater management strategy for the proposed townhouse development. This memo is intended to complement the Water Management Report prepared for this development (Rev04 – 02/06/22).

1. Introduction

Calibre has previously prepared a Water Management Report for the proposed development. This memorandum has been prepared to support the Water Management Report in terms of the Earthworks Strategy, the Stormwater Quality Management Strategy and ground water level impacts due to the proposed earthworks cuts.

The site location is shown in Figure 1.

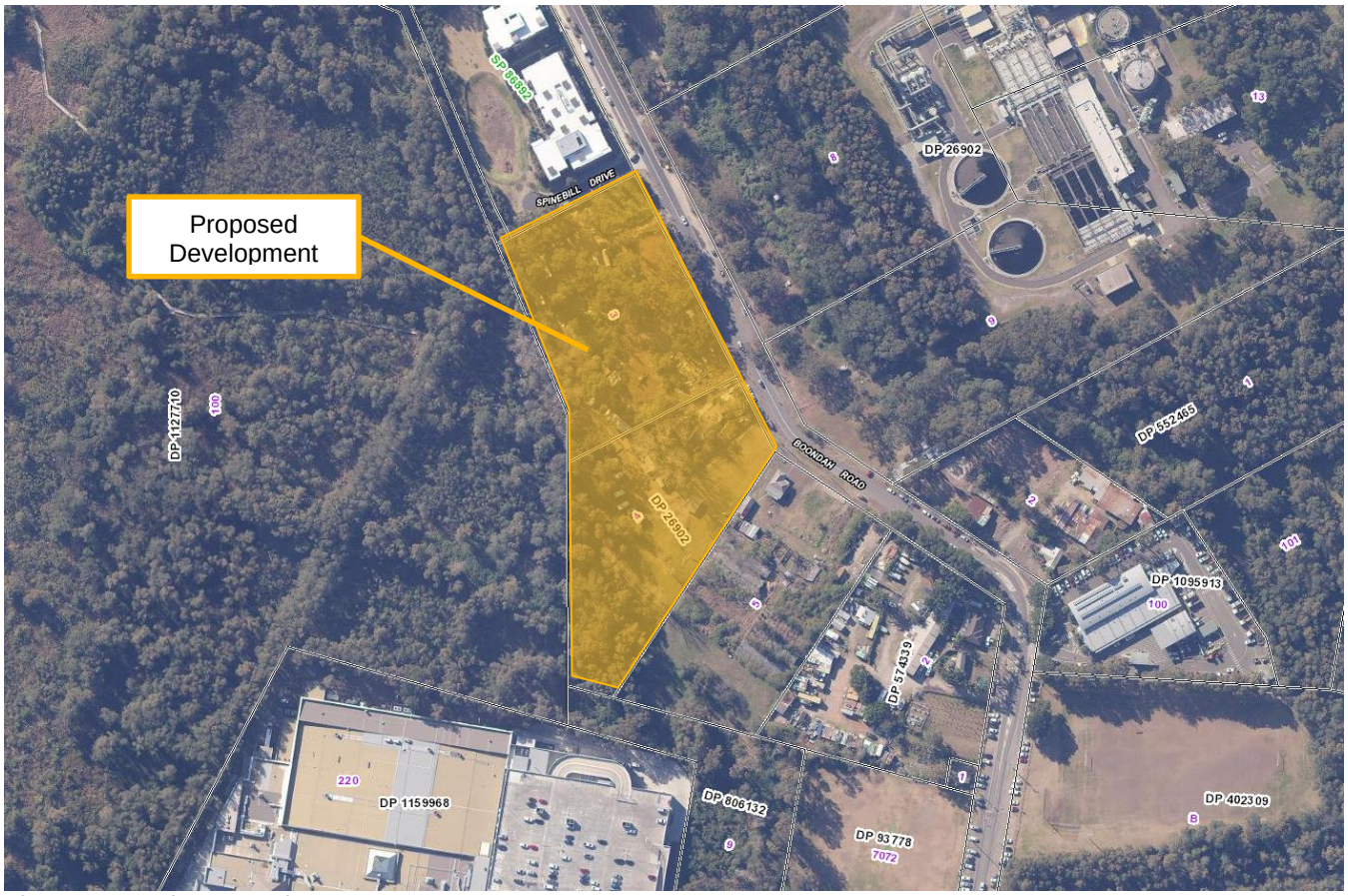

Figure 1: Development Site

Boondah Road fronts the development on its eastern boundary. On the eastern side of Boondah Road is Narrabeen Creek. Warriewood wetlands fronts the development on its western boundary. The proposed development layout is shown in Figure 2.

Figure 2: Proposed Site Plan

Figure 2 indicates that the townhouses will be built fronting internal driveways that connect to Boondah Road. The cycleways, pathways and vegetated areas will be built near the wetlands.

2. Earthworks

2.1 Ground Water Level

The ground water level monitoring for the proposed site has been undertaken by Douglas Partners on 23 November 2016 and 8 August 2019. The latest ground water levels measured at different borehole locations as per the report 'Groundwater Measurements 3-12 Boondah Road, Warriewood' (16/08/2019) is shown in Figure 3 and Table 1 below.

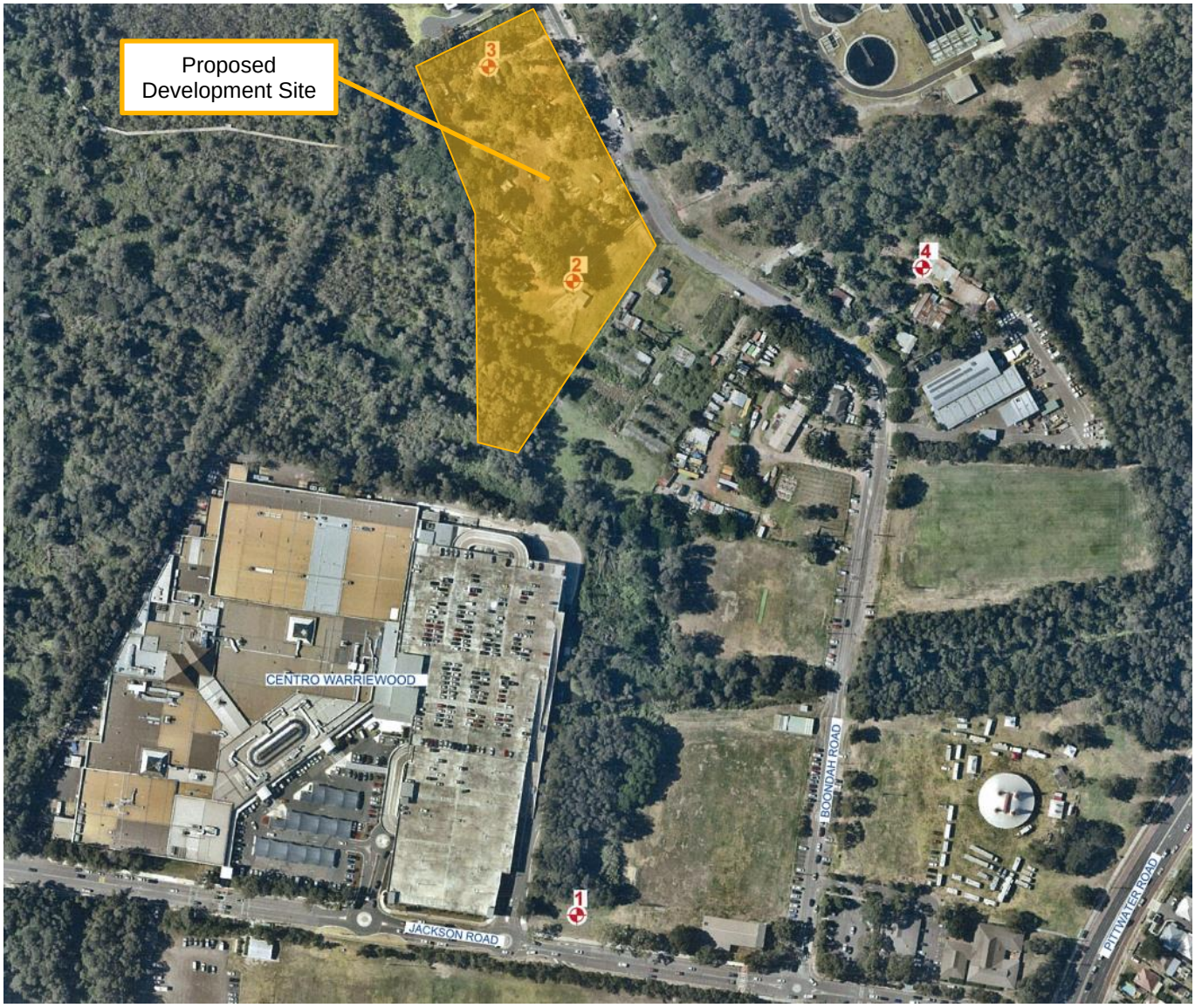

Figure 3: Location of Boreholes (Monitoring Wells) (Douglas and Partners 2016)

Table 1: Summary of Groundwater Measurements in Monitoring Wells

Borehole (Well)	Surface RL (m AHD)	Well Depth (m)	23 November 2016	8 August 2019
			Measured Depth (m) and RL (m, AHD) to Groundwater	
1	2.4	4.9	1.6 (RL 0.8)	1.7 (RL 0.7)
2	2.3	4.0	1.2 (RL 1.1)	1.0 (RL 1.3)
3	4.1	5.8	2.7 (RL 1.4)	2.9 (RL 1.2)
4	2.1	4.0	1.4 (RL 0.7)	Destroyed

The effect of the earthworks on the groundwater levels is determined in Sections 2.2 and 2.3 below.

2.2 Cut/Fill Analysis

Northern Beaches Council requires that proposed land developments be designed according to specific flood level controls, as given in their LEP, DCP and the pre-lodgement notes issued for this development. Calibre has used these controls to determine suitable RLs for each land use of the residential development, as shown in Table 2 below.

Table 2: Proposed Planning Levels for land uses

Area	Flood Level Control	RL
Townhouses	FPL	4.4
Roads and Driveways fronting townhouses	1% AEP + CC	3.9
Play Areas, Parks, and cycleways	20% AEP	2.5
Boondah Road	1% AEP + CC	3.9
Remaining Area (EEC and Riparian Corridor) (undeveloped)	N/A	As per existing conditions

The extent of the planning levels for each land type is shown in Figure 4.

Figure 4: Earthworks Strategy

To match the flood planning levels shown in Table 2, it is required that the site be regraded to accommodate these. The extent of the earthworks cut and fill to match the RLs given in Table 2 is shown in Figure 5 below.

Figure 5: Cut and Fill Plan

2.3 Conclusion on Cut/Fill Affectation on Ground Water Level.

As shown in Figure 5, most of the area where cut has been proposed is located within in proximity to monitoring well 3. As per Table 1, the ground water level at monitoring well 3 is RL 1.2m – 1.4m AHD. The proposed surface level where the cut is proposed is RL 2.5m AHD which is minimum 1.1 – 1.3m above the ground water level at monitoring well 3. Thus, it can be concluded that the proposed cut will not impact ground water flow for this site as per ground water monitoring conducted by Douglas Partners. Detailed groundwater monitoring is proposed at the DA and detailed design stage.

3. Water Quality Modelling

3.1 General overview

The development would lead to a change in catchment hydrology, with the most obvious effect being an increase in stormwater flow. Stormwater from impervious surfaces is typically of poorer quality than runoff from pervious catchment and may result in a progressive deterioration of the environmental values of downstream waterways. Additionally, stormwater runoff from roads contains pollutants that are not typically found in runoff from rural catchments (including litter/gross pollutants, rubber, suspended solids, nitrogen, phosphorus, oil and grease, hydrocarbons, petroleum lead, zinc, iron, copper, cadmium, chromium, nickel, manganese, pesticides, and herbicides).

Pollutant loading for developments are typically expressed by four major variants – Total Phosphorus (TP), Total Nitrogen (TN), Total Suspended Solids (TSS) and Gross Pollutants (GP). Northern Beaches Council strategy for stormwater quality control requires reduction of these major pollutants.

3.2 Water Sensitive Urban Design (WSUD) guidelines

Northern Beaches Councils' Water Sensitive Urban Design guidelines state their required pollutant reduction targets, as shown in Table 3 below.

Table 3: Pollutant Reduction Target (Northern Beaches Council's Water Management for Development Policy, 2021)

Pollutant	Performance Requirements
Total Phosphorous	65% reduction in the post development mean annual load
Total Nitrogen	45% reduction in the post development mean annual load
Total Suspended Solids	85% reduction in the post development mean annual load
Gross Pollutants	90% reduction in the post development mean annual load1 (for pollutants greater than 5mm in diameter)
pH	6.5 - 8.5
Hydrology	The post-development peak discharge must not exceed the pre-development peak discharge for flows up to the 2 year ARI

Commercially available water quality controls are available to reduce the runoff of these pollutants. Calibre has assessed and determined some product types that would be suitable for this development. These measures have been implemented in a preliminary analysis as described in Section 3.3 below.

3.3 Water Quality Treatment

Water Quality Treatment can be provided within lots, private property, or public land. The different water quality treatments that can be applied for this property are listed as below:

1. Rainwater tank: Rainwater tanks help to improve quality of stormwater and hold water for re-use.

2. Filter Devices: There can be different filter devices that can be implemented for this development, from multiple commercial enterprises that may tailor a solution for each development. For this preliminary analysis the filter devices nominated are a Bioretention Basin, Rocla Cleansall 750 Gross Pollutant Trap (GPT), Jellyfish filter cartridge (JF 1200-1-1) and Oceanguard pit capture baskets. Depending on manufacturers recommendations,

these filtration units can be changed to other items to achieve the pollutant reduction targets set by Northern Beaches Council.

3.3.1 Bioretention basin.

The preliminary analysis on size and location of the Bioretention basin has been determined for two scenarios. The scenarios are provided under Sections 3.3.1.1 and 3.3.1.2. Each scenario has used the stormwater quality modelling tool MUSICX (version 1.1.0) to gauge the approximate scale of treatment works necessary to achieve the reduction targets. MUSICX is widely recognised modelling tool in sizing treatment devices for stormwater quality treatment.

3.3.1.1 Distributed Stormwater Discharge to the Drainage Network in Boondah Road and Warriewood Wetlands

The proposed area of the site that has an RL of 3.9m and above can be discharged to the existing kerb inlet pit in Boondah Road shown in Figure 6 below. The area lower than RL 3.9m may be discharged to Warriewood Wetlands towards the rear of the property, as it likely that it will not be able to freely flow to the kerb inlet pit in Boondah Road.

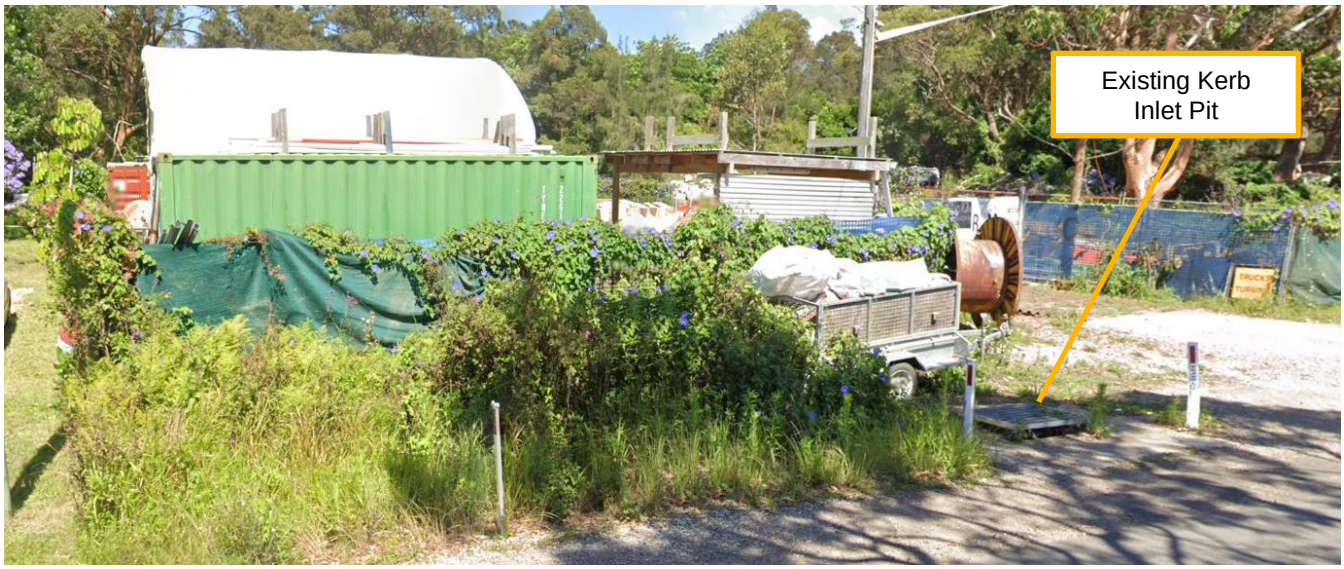

Figure 6: Boondah Road frontage of the subject site (Google Maps)

The MUSICX model for this scenario has been generated such that the area with surface level of RL 3.9 and higher would discharge to Boondah Road via a Bioretention basin. The area lower than RL 3.9m will discharge to Warriewood Wetlands via Oceanguard pit capture baskets (fitted into the road drainage pits) and a Jellyfish filter device. The indicative location of the Bioretention basins and Jellyfish filter for this arrangement is shown in Figure 7.

Figure 7: Indicative location of the Bioretention basins and Filter device

The proposed Bioretention basins configuration is as summarised in Table 4 below.

Table 4: Summary of the Bioretention basins discharging to Boondah Rd

Basin	Filter Area (m^2)	Extended Detention Depth (mm)	Filter Media Depth (mm)
Bioretention	260	300	600

The layout of the MUSICX Model is presented in Figure 8 below.

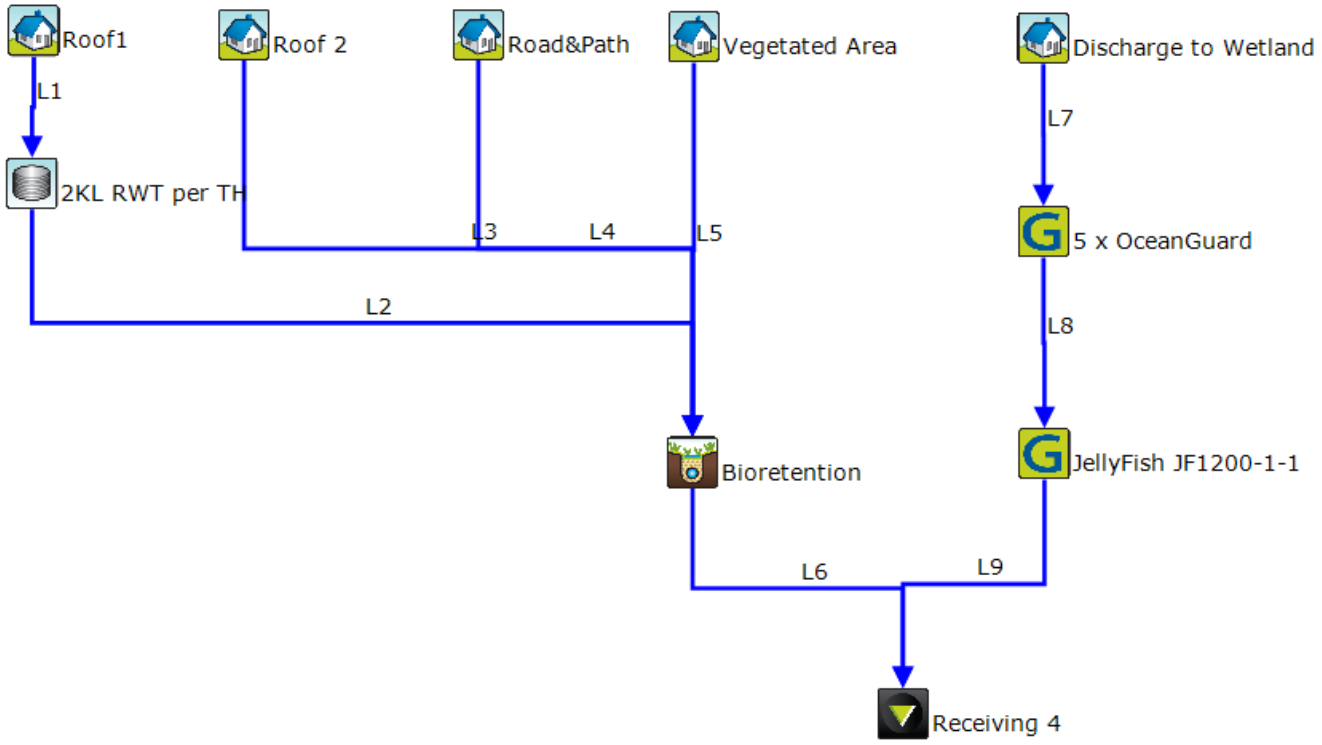

Figure 8: MUSICX Model Layout for distributed stormwater discharged to Wetland and Boondah Rd

The results of this preliminary treatment train for the proposed development at 10 – 12 Boondah Road is shown in Table 5.

Table 5: Result for MUSICX Model for Distributed Stormwater discharge to Wetland and Boondah Rd

Latest Run : Treatment Train Effectiveness : Receiving 4

	Sources	Residual Load	% Reduction
Flow (ML/yr)	14.94	13.17	11.83
Total Suspended Solids (kg/yr)	1482	183.2	87.64
Total Phosphorus (kg/yr)	3.283	1.132	65.52
Total Nitrogen (kg/yr)	30.73	11.85	61.44
Gross Pollutants (kg/yr)	308.5	0.5091	99.83

Table 5 indicates that preliminary treatment train for the development at 10 – 12 Boondah Road will achieve the required reduction targets for Northern Beaches Council, as given in Table 3.

3.3.1.2 Stormwater Discharge to Warriewood Wetlands

If the indicative network in Boondah Road is not available for connection, stormwater runoff from the site may be discharged into Warriewood Wetlands through a Rocla Cleansall 750 GPT and a Bioretention basin. The tentative location of the proposed Bioretention basin is shown in Figure 9 below.

Figure 9: Tentative Location of Bioretention Basin

The proposed Bioretention Basin configuration is as summarised in Table 6 below.

Table 6: Summary of the Bioretention Basin discharging to Warriewood Wetlands

Basin	Filter Area (m^2)	Extended Detention Depth (mm)	Filter Media Depth (mm)
Bioretention	200	300	600

The layout of the MUSICX Model is presented in Figure 10.

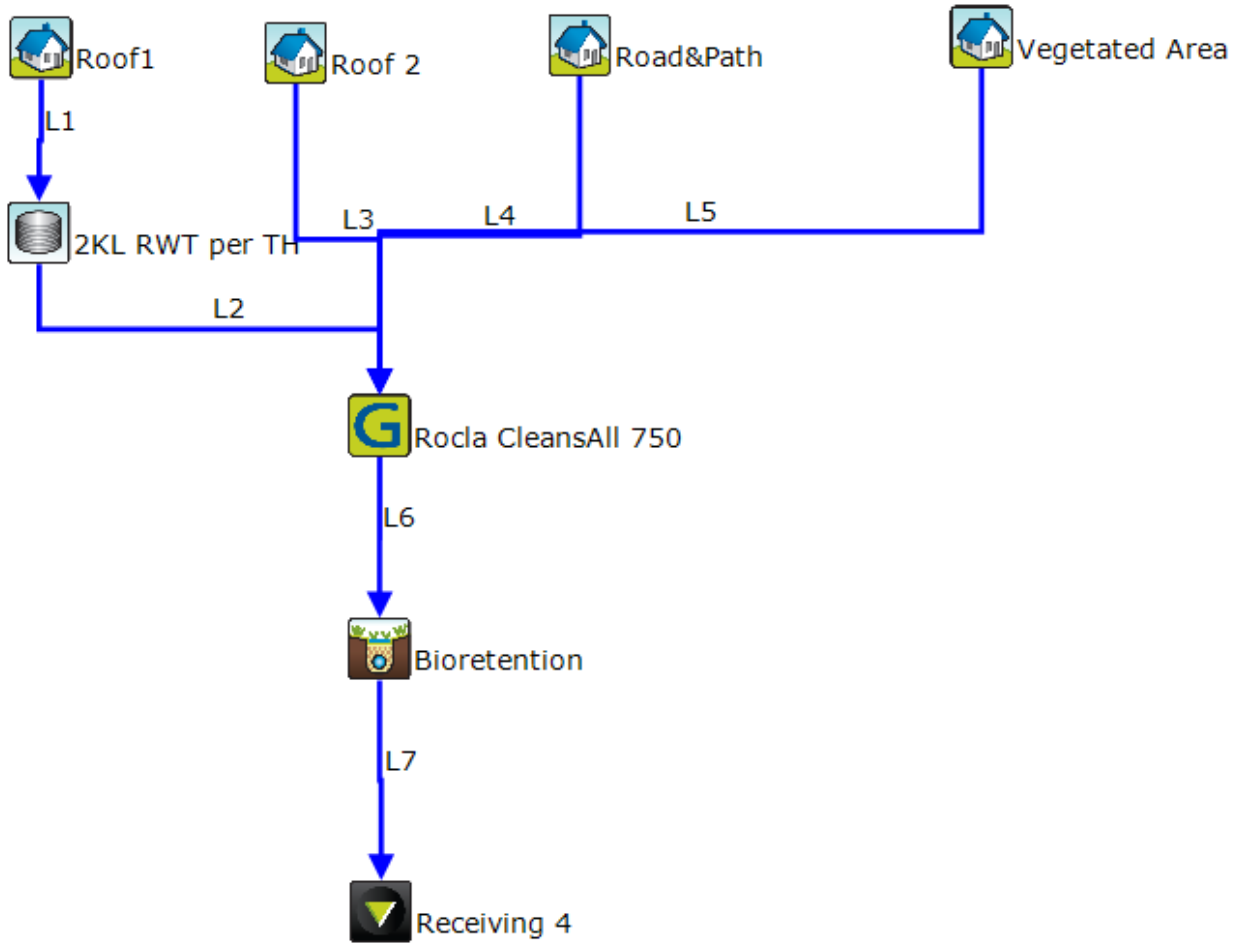

Figure 10: Layout of MUSICX Model for discharge into Warriewood Wetlands

The results of this preliminary treatment train for the proposed development at 10 – 12 Boondah Road is shown in Table 7

Table 7: Result for MUSICX Model for Stormwater discharge to Wetland

Latest Run : Treatment Train Effectiveness : Receiving 4

	Sources	Residual Load	% Reduction
Flow (ML/yr)	14.91	13.04	12.5
Total Suspended Solids (kg/yr)	1467	206.9	85.9
Total Phosphorus (kg/yr)	3.317	1.112	66.47
Total Nitrogen (kg/yr)	30.82	11.98	61.12
Gross Pollutants (kg/yr)	274.2	0	100

Table 7 indicates that the preliminary treatment train for the development at 10 – 12 Boondah Road will achieve the required reduction targets for Northern Beaches Council, as given in Table 3.

3.4 Conclusion on Water Quality Modelling

The results for both scenarios show that the proposed water quality arrangements will meet the water quality reduction target set by Northern Beaches Council. Thus, it is demonstrated that stormwater discharged from the proposed development site will not pollute the downstream watercourse with appropriate measures in place. Suppliers of these products may be consulted for recommendations on measures to suit the local area and development.

4. Flooding Strategy

4.1 Introduction

As mentioned under Section 2.2, Northern Beaches Council requires that proposed land developments be designed according to specific flood level controls, as given in their LEP, DCP and the pre-lodgement notes issued for this development. Calibre has used these controls to determine suitable RLs for each land use of the residential development, as shown in Table 2. This has required a proposed raising of land across the site, as shown in Figure 5.

Calibre raised an inquiry with Northern Beaches Council about use of suitable controls for the flood management strategy of this site, as there was concern that the raising of the land in 10 – 12 Boondah Road may have a negative impact on the surrounding development. Council has confirmed that the residential development is to ensure at a minimum, that no adverse flood impacts on the site and surrounding properties be observed up to and including the PMF event with the effect of climate change (see Appendix A). Calibre has adopted this approach for the flood management strategy.

4.2 Flood Behaviour and Storage Assessment

10 – 12 Boondah Road sits within flood prone land. Calibre acquired the Narrabeen Lagoon Flood Study (2013) from Council to assess the development earthworks against the flooding for all required storm events. The complete strategy and assessment are provided in the report '10 – 12 Boondah Road, Warriewood – Water Management Report' (2/06/22). This assessment included the frequent and minor storms such as the 50% AEP to the very rare and extreme Probable Maximum Flood (PMF).

The Narrabeen flood study depicts the flooding behaviour critical to this development area. The flood behaviour is such that the wetlands, creeks, and areas south of the development site will pond with water in a storm event. As such, the extent of the ponding increases with storm intensity and duration. Any impacts on the flood extents owing to the earthworks will be distributed within the large area of the floodplain. The minimum extent of the floodplain is shown in Figure 11. The extent presented is at timestep zero of a storm event, hence the water extents presented below are ponding.

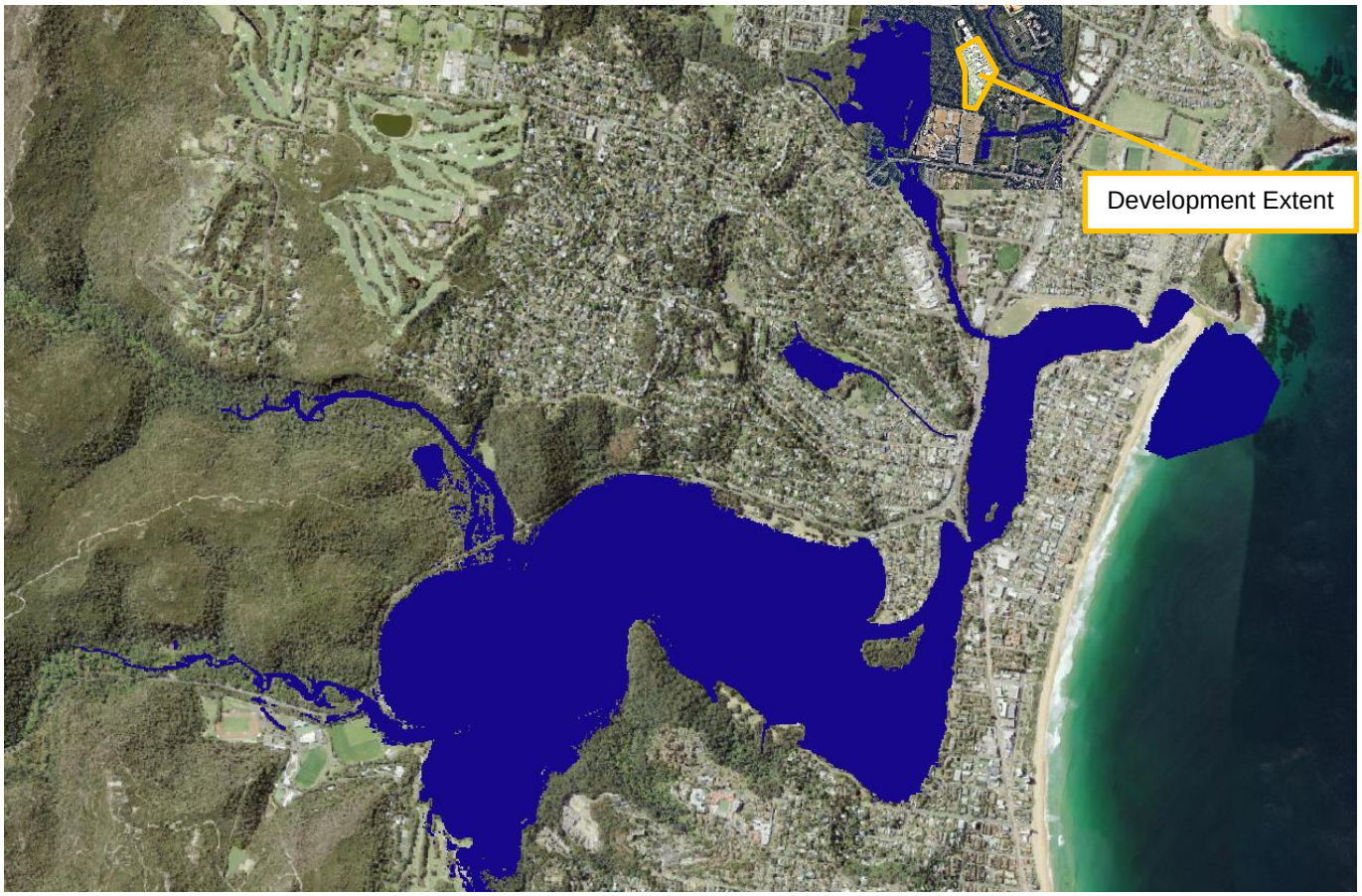

Figure 11: Narrabeen Lakes Floodplain (300 Ha)

The extent of the floodplain where the impact of the development is distributed over is 300 Ha. Any impact on the floodwater extent and height by the development earthworks at 10 – 12 Boondah Road would be distributed across this area; the development fronts onto this floodplain and any extra floodwater runoff will build on this 300 Ha extent. Any loss in local flood storage incurred by the development at 10 -12 Boondah Road will be distributed across a minimum floodplain area.

Council has expressed a concern that development of the site without a balance of flood storage within the property boundaries, could contribute to a cumulative effect. They are concerned the loss of flood storage may impact the possibility of other sites seeking to achieve developable areas through similar earthworks.

Calibre has undertaken a desktop analysis of the possibility of future development of available land within the flood zone. The current land zoning of the Warriewood wetlands and surrounding area has been overlaid against the flood extents. The overlay does not have a georeference associated with it, and hence the alignment shown in Figure 12 is approximate.

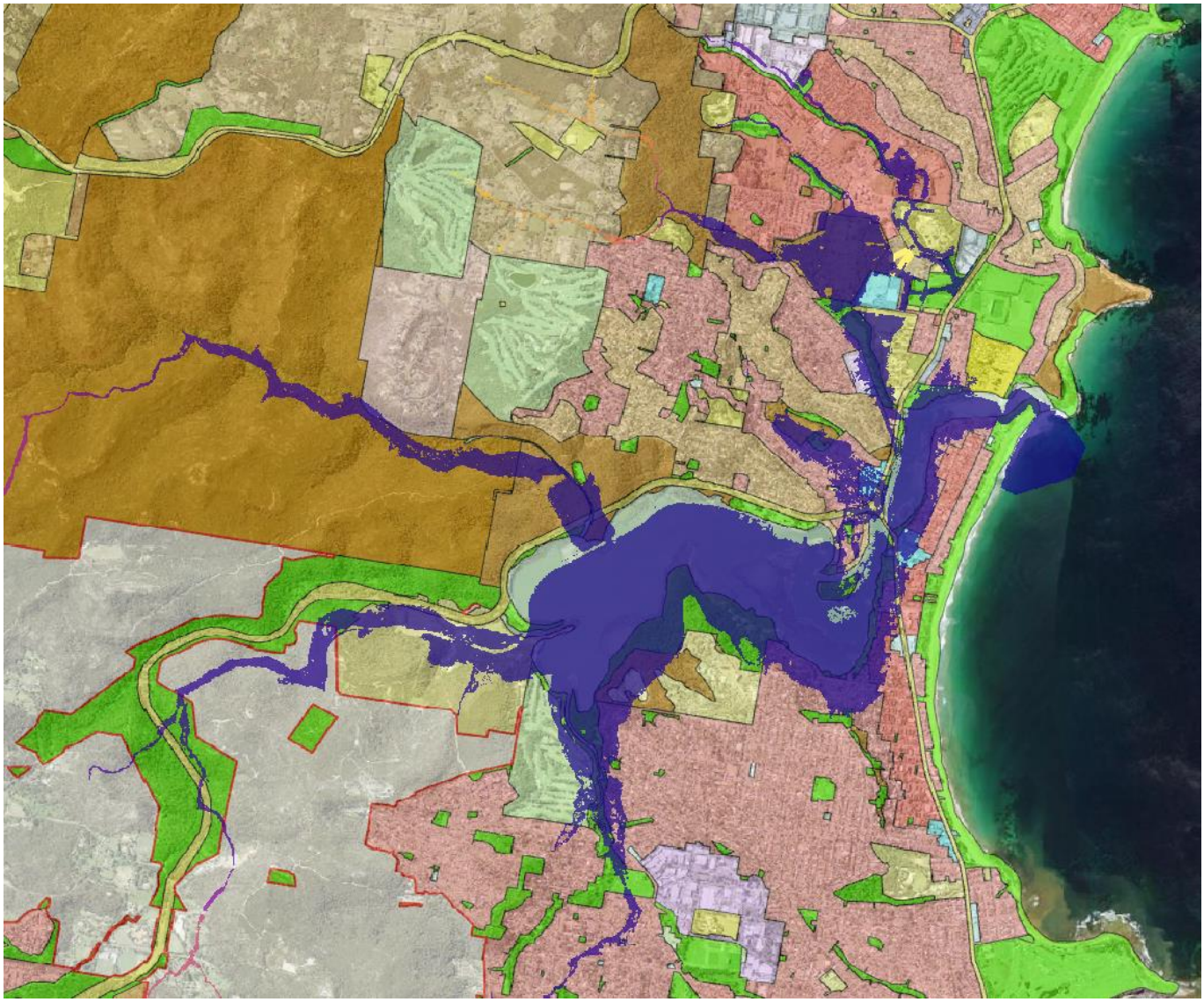

Figure 12: 50% AEP Flood Extents and Land Zoning

Generally, the land zoning occupied by the flood extents are SP2 (Infrastructure), R2 and R3 (low and medium density residential), C2 (environmental conservation) and RE1 (public recreation). A desktop search of the zoning plan indicates that the R2 and R3 lands are already developed or show evidence of bulk earthworks taking place. It is assumed that the C2 and RE1 will not be rezoned for future residential purposes. There is some RU2 (rural landscape) available for development (part of which is 10 -12 Boondah Road). The extent of the RU2 land is shown in Figure 13.

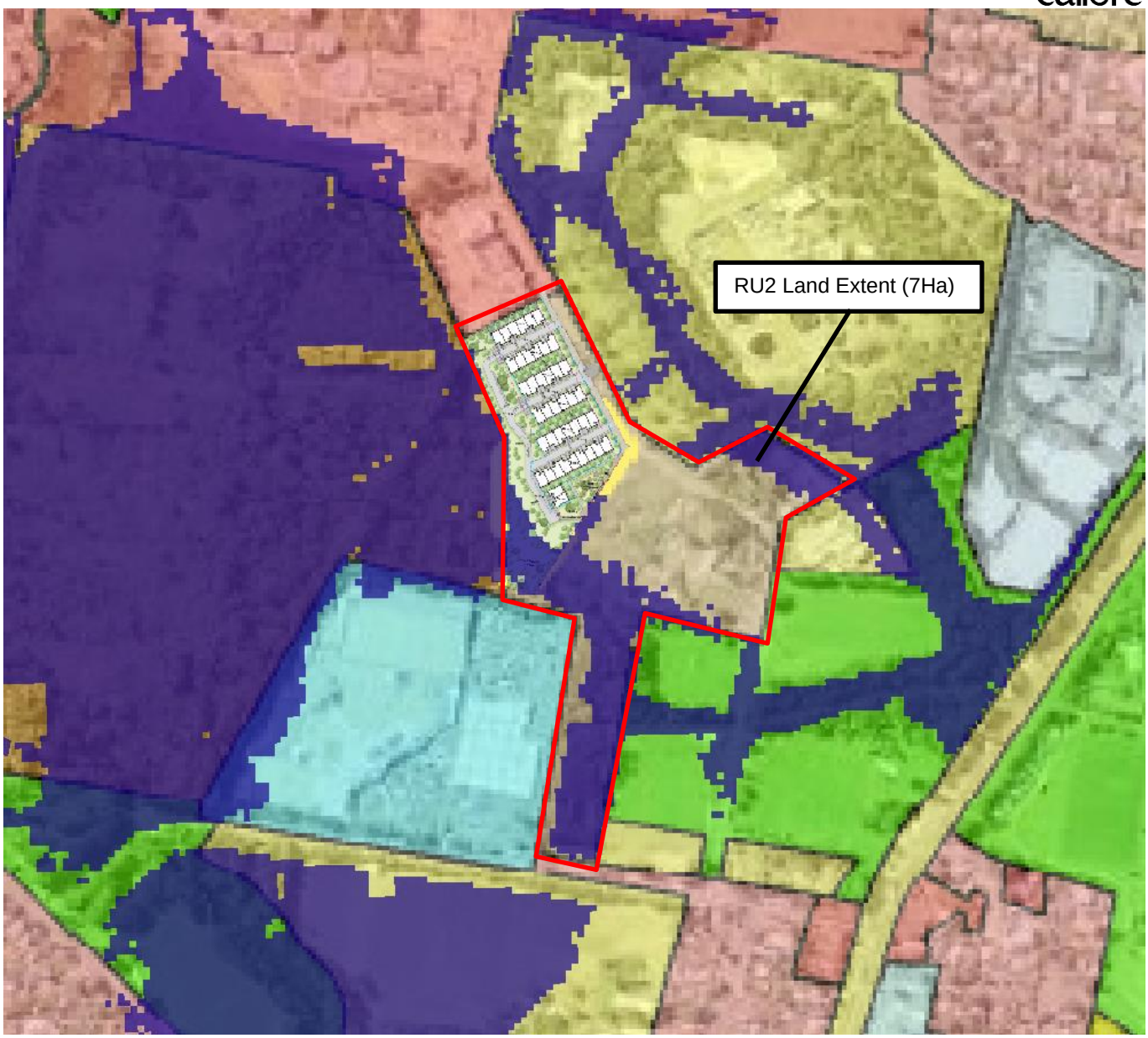

Figure 13: 50% AEP Flood Extents and RU2 land

The extent of the RU2 land is shown outlined in red above. The development at 10 – 12 Boondah Road occupies 2.2 Ha, leaving 4.8 Ha available for development. The land to the south of the subject site and directly east of the shopping complex is densely vegetated and crosses Narrabeen creek. Calibre expects that it is occupied by sensitive/endangered vegetation, and thus may not be suitable for development. The remainder of the RU2 land is further outside the flood extents than the subject site (2.8 Ha). As the current earthworks will be distributed over a floodplain area of 300 Ha, and the afflux increases are acceptable (see Table 8 below), Calibre believes that any future development on the remaining 2.8 Ha will not experience a cumulative impact on loss of flood storage.

4.3 Flood Afflux Assessment

The afflux distribution results over the floodplain, as modelled by Calibre for the Water Management Report, are given in Table 8. Flood maps for each event are in the report.

Table 8: Afflux distribution results over the floodplain

Event	Acceptable Afflux (mm)	Maximum Afflux Observed (mm)	Comment
50% AEP	20	<10	Complies
20% AEP	20	<10	Complies
1% AEP	20	25	The 25mm increase occurs in a non-habitable area, thus persons should not be affected. The remainder of the floodplain remains within acceptable afflux limits. This afflux is due to the proposed raising of Boondah Road and may be reduced to within acceptable afflux limits by placing culverts or pipes under Boondah Road as demonstrated in the Water Management Report.
1% AEP + CC	20	<10	Complies
PMF	50	<10	Complies
PMF + CC	50	<10	Complies

Table 8 summarises that the afflux in all the storm events is acceptable. The 1% AEP event has a peak increase of 25mm, but this is isolated to a non-habitable region where people will not be dwelling. Calibre has also proposed a strategy to reduce the afflux within this affected area to suitable levels (refer to Figure 15 and Page 25 in the report).

The other aspect of adverse impacts are increases in velocity and hazard. The PMF event does demonstrate increases of velocity above 10%, but these are in small, discrete areas away from residential dwellings, and remain within the 0 – 0.5m/s range, which is acceptable for nearly all material types (see Figures 23 – 25 in the report).

4.4 Overland Flow to Wetland

A Plan of Management (POM) was issued by Ecological Australia and the Sydney Metropolitan Catchment Management Authority (CMA) for Warriewood Wetland in 2010. The plan presents a detailed vegetation management program, and study of the topography, geology and water behaviour of the area. Section 4.4.2 of the plan identifies the major sources of surface flow to the wetland as being Mullet Creek and Fern Creek. Both creeks are not being affected by the development at 10 -12 Boondah Road Warriewood. The plan states other minor drains enter from developed areas around the wetland. These developed areas have impacts mitigated onsite by conditions set out in the Warriewood Valley Water Management Specification. Stormwater flows generated from the development site are proposed to be filtered to acceptable levels of pollutant removal (as demonstrated in Section 3.3 of this memo) and may be directed in their entirety to the Warriewood Wetlands.

The Water Management Report demonstrates that the flood afflux at Warriewood Wetland due to the construction of proposed development will be less than 10mm for flood events ranging from 50% AEP to PMF, where the Maximum Afflux limit allowed by council is 20mm. Furthermore, the report illustrates the velocity and flood risk precinct for post development scenario will remain like the pre-development scenario during 50% AEP to PMF flood events. Thus, the proposed development will not worsen the flooding conditions within Warriewood Wetland. Section 4.2 describes the possibility of placing culverts or pipes under Boondah Road and connecting it to the Warriewood Wetland to reduce the flood afflux in Narrabeen Creek. The flood water which will pass onto Warriewood Wetland from upstream of Boondah Road will be distributed within the large area of the floodplain shown in Figure 11 and will result in minimal impact to wetland. Moreover, the wetland is already affected by high flood hazard, and it is evident that diverting the flow from Boondah Road will not further worsen the flood risk in the wetland. Additionally, the culverts under the raised up Boondah Road would preserve any stormwater flows from the eastern side of Boondah Road that currently flow to the wetlands. Therefore, the existing overland flow volumes to the Warriewood wetlands shall be preserved post development.

5. Conclusion

The proposed development at 10 – 12 Boondah Road will be approximately 42 new townhouse dwellings, a children's playground, and pedestrian walkways. Calibre has prepared a stormwater strategy report for this development in June 2022. This memo has been prepared to accompany and supplement this report, and provides preliminary findings for:

- Groundwater analysis; The proposed earthworks cuts will be clear of the groundwater and therefore impacts to groundwater are unlikely. Further groundwater monitoring is proposed at DA Stage to confirm this.

- Stormwater quality treatment: two scenarios have been modelled, and indicative treatment measures and sizes are modelled for each and confirm that satisfactory pollutant reduction may be achieved.

- Overland Flow to the wetland; the flood modelling provided for the water management report demonstrates that the proposed development will not worsen the flood conditions in the wetland for a full range of storm events. Overland flow volumes to the Warriewood Wetlands will be preserved post development.

The flooding strategy from the report has been summarised in this memo. As per council's correspondence attached and in accordance with the DCP controls for the Warriewood Valley Land Release, the criteria for development within a flood prone area regarding adverse impacts has been followed and complied with.

Appendix A

COUNCIL DCP CORRESPONDANCE (25/01/22)

Matthew Cowcher

From: Patrick Stuart <Patrick.Stuart@northernbeaches.nsw.gov.au>
Sent: Tuesday, 25 January 2022 4:06 PM
To: Matthew Cowcher
Subject: RE: Flood Information Report for 10 Boondah Rd Warriewood

Hi Matthew,

As a minimum you should comply with one of the below points (from section of C6.1 of the Pittwater DCP) for the PMF plus CC (along with all smaller events).

The filling of land will only be permitted where it can be demonstrated within the Water Management Report that:

- *there is no net decrease in the floodplain volume of the floodway or flood storage area within the property, for any flood event up to the 1% AEP flood event and the PMF event including climate change considerations for both design events; and/or*
- *there is no additional adverse flood impact on the subject and surrounding properties and flooding processes for any flood event up to the PMF event including climate change impacts.*

Don't forget, you still need to comply with the below table from the Warriewood Valley Urban Land Release Water Management Specification. As well as 5.21 of the Pittwater LEP and B3.11 and B3.12 of the Pittwater DCP (which shouldn't be too hard).

Table 4.3 Flood Planning Levels

Design Level	Requirement
50%AEP (1 in 2 year ARI)	• 50%AEP flow to be carried in-bank
20%AEP (1 in 5 year ARI)	• The level of walkways and cycleways adjacent to the creeks are to be above the 20%AEP flood level except under special circumstances (and exposed for only short duration's) • Water quality control ponds, filter strips and structures are to be above the 20%AEP flood level, and can be below the 1%AEP flood level but must lie within the private buffer area as outlined in Section 4.3.2.
1%AEP (1 in 100 year ARI)	• 1%AEP flows are to be carried within the public space corridors, and are to be further designed such that floodplain management and hazard management guidelines are accommodated to minimise risk to life • Flood extent to be mapped • Floor levels for properties adjacent to the creek are to be set at least 0.5 m above the 1%AEP level • Obverts of bridge decks of evacuation routes are to be set at least 0.5 m above the 1%AEP level
Probable Maximum Flood	• Evacuation Planning • Flood hazards and risk to life • Flood extent to be mapped

Regards,

Patrick Stuart
Senior Floodplain Management Officer

Stormwater, Floodplain Engineering
t 02 8495 6649 **m** 0435 966 850
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West Ryde NSW 1685
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Memorandum

To	Henroth Investments Pty Ltd	Dan Maurici	dan@henroth.com.au	
From	Scott Easton		**Date**	16 August 2019
Subject	Groundwater Measurements 3-12 Boondah Road, Warriewood		**Project No.**	85749.00

This provides the factual results of groundwater monitoring undertaken at 3-12 Boondah Road, Warriewood. The monitoring was carried out at the request of Henroth Investments Pty Ltd (Henroth).

Groundwater levels were measured on 8 August 2019 in wells previously installed by DP in 2016 (see attached Drawing 1). Bores 4 appears to have been destroyed.

A summary of the measured groundwater levels within the monitoring wells is provided in Table 1.

Table 1: Summary of Groundwater Measurements in Monitoring Wells

Borehole (Well)	Surface RL (m, AHD)	Well Depth (m)	Measured Depth (m) and RL (m, AHD) to Groundwater in Monitoring Wells	
			23 November 2016	8 August 2019
1	2.4	4.9	1.6 (RL0.8)	1.7 (RL0.7)
2	2.3	4.0	1.2 (RL1.1)	1.0 (RL1.3)
3	4.1	5.8	2.7 (RL1.4)	2.9 (RL1.2)
4	2.1	4.0	1.4 (RL0.7)	destroyed

Groundwater levels will fluctuate and may temporarily rise by at least 1 m (or higher and up to flood levels) following prolonged rainfall. Further monitoring would be required to assess fluctuations in groundwater levels.

We trust the above satisfies your present requirements. Please contact the undersigned should you have any queries.

Yours faithfully,
Douglas Partners Pty Ltd

Scott Easton
Principal

Attached: About this Report
Drawing 1 – Location of Boreholes

About this Report

Douglas Partners

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

About this Report

Site Anomalies

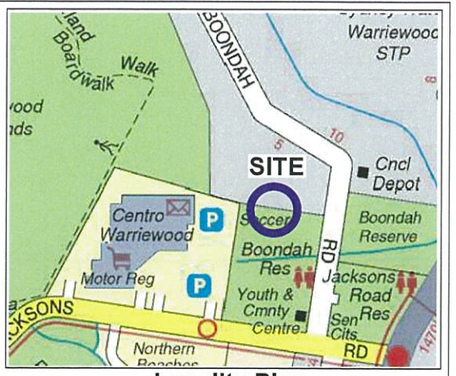
In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.



Locality Plan

NOTE:
1: Base image from Nearmap.com (Dated 17 November 2016)
2: Test locations are approximate only and are shown with reference to existing features.

0 10 20 30 40 60 80 100 150 200 250m

1:2500 @ A3

LEGEND

Borehole location

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Henroth Investments Pty Ltd		TITLE: **Location of Boreholes**
OFFICE: Sydney	DRAWN BY: PSCH	**Proposed Bulky Goods Centre**
SCALE: 1:2500 @ A3	DATE: 25.11.2016	**3-12 Boondah Road, WARRIEWOOD**

N

PROJECT No:	85749.00
DRAWING No:	1
REVISION:	0

Our ref: 18HEN03.2 BCAR

12 October 2022

Paula Moretti
Northern Beaches Council
PO Box 82
Manly NSW 1655

Attention: P Moretti

Dear Paula

- **Re: Biodiversity Certification Assessment Report for 10 and 12 Boondah Road, Warriewood**

On behalf of Henroth Group

I make reference to the above Biodiversity Certification Application and associated Biodiversity Certification Assessment Report (BCAR), which have been prepared in support of the Planning Proposal.

Henroth Group (The Proponent) has made application for biodiversity certification under the Biodiversity Conservation Act 2016 (BC Act). In support of the application, *Travers bushfire & ecology*, has prepared a Biodiversity Certification Assessment Report (BCAR).

In accordance with Section 8.4(2) of the Biodiversity Conservation Regulation 2017 (BC Regulation), Council is invited to provide comment on the final BCAR as part of the application process. We advise that under the BC Regulation we are required to allow at least 42 days to respond. To assist in this process, the below link provides access to the BCAR. Not accounting for the period upon which Council has already had access to previous versions of the BCAR, and accepting that this letter commences the formal process, the 42-day consultation period is considered to conclude at the close of business on 23 November 2022.

https://drive.google.com/drive/folders/1mCJInKLhpIhhy6-GuXUafmd3Ac4RD5nT?usp=sharing

Updates to BCAR following Environment and Heritage Group (EHG) response

Travers bushfire & ecology prepared a Biodiversity Certification Assessment Report (BCAR) in association with a planning proposal at 10 and 12 Boondah Road, Warriewood (Lots 3 and 4 DP26902).

This BCAR along with supporting documents, was submitted to the Environment and Heritage Group (EHG) on 6th May 2022, and a response including multiple recommendations was provided by the EHG on 25th July 2022 (EHG ref. DOC21/190387-3). The BCAR was amended where appropriate to address these recommendations.

To help in your review, the key updates are summarised as follows:

- Further detail is provided in Sections 5.5.2 and 5.5.3 to assess direct and indirect impacts, and in Section 5.4 regarding mitigation measures
- Table 2.1 of the BCAR has been amended to ensure survey effort values are correct and consistent
- Additional targeted survey for Koala, Squirrel Glider, Grey-headed Flying-fox, owl and cockatoo breeding habitat, and Maroubra Woodland Snail has been completed in August 2022 (Table 2.1, Figure 3.3 of BCAR). Table 4.3 of the BCAR assessing candidate species has been revised
- Further detail is provided within Section 2.3 and Table 2.1 of the BCAR describing potential habitat for candidate frog species and frog survey techniques
- Errors in credit assessment have been corrected. Eastern Bristlebird and Giant Burrowing Frog are not listed as a candidate species by the BAM calculator, and are not associated with PCTs 1232 and 1793. As such these been removed from the assessment as candidate species
- Section 4.2.2.(b) of the BCAR has been updated to reference Chapter 4 of State Environmental Planning Policy (Biodiversity and Conservation) 2021 (Koala Habitat Protection) rather than the repealed State Environmental Planning Policy (Koala Habitat Protection) 2021
- Further detail is provided in the BCAR on the creation of species polygons toward the end of Section 5.6 of the BCAR.

Further information requested following meeting with Council (21st Sept 2022)

In an online meeting on 21st September 2022 to discuss the planning proposal, Council identified several ecological and bushfire items for clarification or further detail. These are addressed below.

<u>Coastal Wetland</u>

The Masterplan has been re-designed to further avoid impacts on the areas mapped as Coastal Wetland on the Coastal Wetlands and Littoral Rainforest Area Map – see Attachment 1 below. The proposed C2 land will now encompass all of the mapped wetland. This change is yet to be incorporated into the BCAR.

<u>Landscaped buffer</u>

Council identified that a landscaped buffer is required between the proposed development and the wetland. This location forms park of the Asset Protection Zone (APZ), and it was questioned whether a landscaped buffer is permissible within an APZ. We confirm here that landscape plantings are permissible within the APZ in compliance with the Planning for Bushfire Protection (PBP) requirements for Inner Protection Areas (IPAs) as follows:

Trees

- *tree canopy cover should be less than 15% at maturity;*
- *trees at maturity should not touch or overhang the building;*
- *lower limbs should be removed up to a height of 2m above the ground;*
- *tree canopies should be separated by 2 to 5m; and*

- *preference should be given to smooth barked and evergreen trees.*

Shrubs

- *create large discontinuities or gaps in the vegetation to slow down or break the progress of fire towards buildings should be provided;*
- *shrubs should not be located under trees;*
- *shrubs should not form more than 10% ground cover; and*
- *clumps of shrubs should be separated from exposed windows and doors by a distance of at least twice the height of the vegetation.*

Grass

- *grass should be kept mown (as a guide grass should be kept to no more than 100mm in height); and*
- *leaves and vegetation debris should be removed.*

All landscaping is to use native species, not limited to the APZ / Landscaped Buffer, to expand the effectiveness of the buffer and allow for better site management adjoining a sensitive landscape.

Bangalay Sand Forest TEC

The subject land contains 0.23 ha of *Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions* TEC, which will be impacted by the proposal. This vegetation is highly disturbed, and is comprised of canopy trees with virtually no native understorey.

The masterplan design allows for landscaped areas that are to be planted with native species commensurate with Bangalay Sand Forest. It is estimated that up to 0.5 ha would be available for replanting within the site (including APZ) which is slightly more than a 2:1 replacement to impact ratio. Although fully-structured forest within these replacement plantings may not be achievable, it is likely they would still achieve more diverse floristic structure compared with the existing Bangalay Sand Forest due to the presence of shrubs and ground layers and management of exotic species.

Table 1 – Impacts and potential replacement plantings of Bangalay Sand Forest TEC within subject land

	Impacted	Potential replanting within landscaping	Net outcome
Area (ha)	0.23	c. 0.5	+0.27
No. trees	27	c. 44	+17

If you require any further information, please do not hesitate to the contact the undersigned on 1300 896 998 or at servicedesk@traversecology.com.au

Yours faithfully

George Plunkett

Botanist - ***Travers bushfire & ecology***

Attachment 1: Amended biodiversity certification area

Legend

- Site boundary (2.04ha)
- Biodiversity certification area (1.78ha)
- Amended Biodiversity certification area (1.7ha)
- Coastal wetlands
- Proximity area for coastal wetlands

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A TBE ENVIRONMENTAL COMPANY

PROJECT & MXD REFERENCE	DATE & ISSUE NUMBER	SCALE & COORDINATE SYSTEM
10 & 12 Boondah Road, Warriewood 18HEN03.4_P001	10/10/2022 Issue 1 SC	1:1,000 @ A3 GDA 1994 MGA Zone 56

0 20 40 m

TITLE

Amended Biodiversity Certification Area

Disclaimer: The mapping is indicative of available space and location of features which may prove critical in assessing the viability of the proposed works. Mapping has been produced on a map base with an inherent level of inaccuracy, the location of all mapped features are to be confirmed by a registered surveyor.

Document Path: N:\GIS STORAGE\N Drive\18HEN03 - BoondahRd Warriewood\MXDs\18HEN03.4\18HEN03.4_P001.mxd

PLANNING PROPOSAL

Site Plan

SCALE 1 : 500

Project
WARRIEWOOD
10 Boondah Rd, Warriewood, New South Wales 2102

Project Number
10

Status

Rev.	Date	Description	Iss.	Appr.
1	27/05/2022	DRAFT	RW	AP
2	01/06/2022	PP	RW	AP
3	05/10/2022	DRAFT	RW	AP

Drawing Number
AMP-0102

0 10 20 40 60M

Scale
As indicated @A1

Revision
3

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