

**FLOOD INUNDATION &
RISK ASSESSMENT REPORT
PROPOSED SUBDIVISION
12A JOHN ST
AVALON**

**Job No 181005
Nov 2019
Prepared by
Lucas Molloy
BE CPEng NER**

INTRODUCTION

This report has been prepared in support of the proposed Development Application for a property sub division at No 12A John St Avalon in respect to potential flood inundation / impacts and Northern Beaches Councils DCP requirements - Pittwater 21 DCP Section B3.11 Flood Prone Land and Section B3.13 Flood Hazard Flood Emergency Response planning.

It is proposed to sub divide the existing single residential lot into 2 residential lots refer Appendix A.

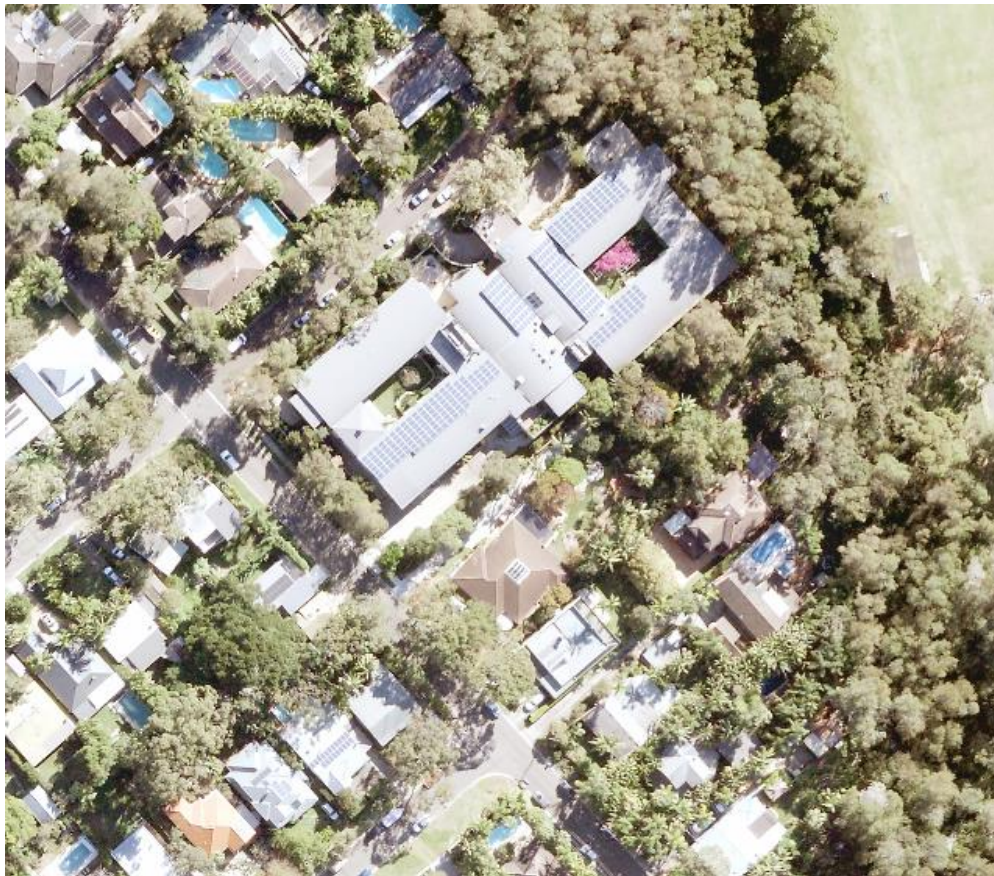
Barrenjoey Consulting Engineers p/l inspected the site on 30th Sept 2019.

The extent of flooding is as summarized in the "Flood Information Request" data as supplied by Northern Beaches Council, refer Appendix D.

The Flood Planning Level varies across the site and at worst case is 3.05m AHD.

For the 1% AEP event the site is classified -

Flood Hazard	varies across site H1 – H5
Flood Hydraulic Category	Fringe + storage
Flood Risk Precinct	varies across site Low / Medium / High
Land Use Group	Sub Division



Aerial Image of No 12A John St Avalon
(Northern Beaches Council web site)

Pittwater 21 Development Control Plan - 2014

B3.11 Flood Prone Land

1.2 Prescriptive Controls

A. FLOOD EFFECTS CAUSED BY DEVELOPMENT

A1	na
A2	na
A3	The applicant shall include in their submission, calculations to illustrate that any fill or other structures that reduce the total flood storage are replaced by Compensatory Works. No fill / structures proposed within flood storage areas
A4	na

B. DRAINAGE INFRASTRUCTURE AND CREEK WORKS

B1	Flood mitigation works or stormwater devices that modify a major drainage system, stormwater system, natural water course, floodway or flood behaviour within or outside the development site may be permitted subject to demonstration through a Flood Management Report that they comply with the Flood Prone Land Design Standard found on Council's webpage. No flood mitigation works are proposed.
B2	A Section 88B notation under the Conveyancing Act 1919 may be required to be placed on the title describing the location and type of flood mitigation works with a requirement for their retention and maintenance. No flood mitigation works are proposed.

C. BUILDING COMPONENTS AND STRUCTURAL SOUNDNESS

C1	na
C2	na
C3	na

D. STORAGE OF GOODS

D1	na
D2	na

E. FLOOD EMERGENCY RESPONSE

E1	Development shall comply with Council's Flood Emergency Response Planning for Development in Pittwater Policy and the outcomes of any Flood Risk Emergency Assessment Report where it applies to the land. Achievable by adhering to this report.
E2	na
E3	na
E4	The application shall demonstrate that evacuation/shelter in place in accordance with the requirements of this DCP will be available for any potential development arising from a torrens title subdivision. Any proposed residence will be able to provide shelter in place as required by the DCP (refer to spate DA for residences).

F. FLOOR LEVELS

F1	na
F2	na
F3	na
F4	na
F5	The applicant must demonstrate that future development following a subdivision proposal can be undertaken in accordance with this Control. na
F6	na
F7	na
F8	na
F9	na
F10	na
F11	na

G. CAR PARKING

G1	Open carpark areas and carports shall not be located within a floodway. No works proposed with a floodway
G2	na
G3	na
G4	na
G5	na
G6	na
G7	na
G8	na
G9	na
G10	na

H. FENCING

H1	Fencing, including pool fencing, shall be designed so as not to impede the flow of flood waters and not to increase flood affectation on surrounding land. Appropriate fencing must comply with the Flood Prone Land Design Standard in addition to other regulatory requirements of pool fencing. Achievable and to be conditioned within the Development Approval
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I. POOLS

I1	na
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FLOOD RISK ASSESSMENT

A flood risk assessment was carried out for the 1% AEP and PMF event adopting the following

- Likelihood of the hazard occurring
 - Almost Certain 1:10
 - Likely 1:100
 - Possible 1:1000
 - Unlikely 1:10000
 - Rare 1:100000
- Consequence of the hazard to persons and property
 - Insignificant no injury / \$ 0 - low
 - Minor first aid injury / \$ low - medium
 - Moderate medical treatment required / \$ medium – high
 - Major serious injuries / \$ major
 - Catastrophic death / \$ major ++

	Insignificant	Minor	Moderate	Major	Catastrophic
Almost Certain					
Likely (1%)					
Possible					
Unlikely (PMF)					
Rare					

Legend

Low - acceptable
Moderate – tolerable
Sever – unacceptable

1 Risk to persons 'shelter in place' provisions as per the *Flood Risk Management Report* specified / ensured, therefore risk assessment -

1% event – na therefore acceptable risk assessment

PMF event – minor injuries possible therefore low / acceptable risk assessment

2 Risk to structures adequate structural capacity to resist the flood forces (water and debris) as per the *Flood Risk Management Report* specified / ensured, therefore risk assessment -

1% event – na therefore acceptable risk assessment

PMF event – minor damage to structures therefore low / acceptable risk assessment

2 Risk to vehicles vehicles protected from flood exposure, therefore risk assessment -

1% event – na therefore acceptable risk assessment

PMF event – minor damage therefore low / acceptable risk assessment

3 Risk to services protection of services from flood exposure as per the *Flood Risk Management Report* specified / ensured, therefore risk assessment -

1% event – na therefore acceptable risk assessment

PMF event – minor damage therefore low / acceptable risk assessment

SUMMARY

Assessment of Impacts Compliance Table

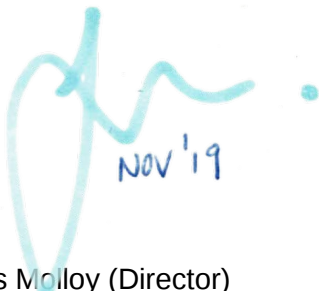
	Not Applicable	Compliance	
		Yes	No
A Flood effects caused by Development	-	X	-
B Drainage Infrastructure & Creek Works	-	X	-
C Building Components & Structural	X	-	-
D Storage of Goods	X	-	-
E Flood Emergency Response	-	X	-
F Floor Levels	-	X	-
G Car Parking	-	X	-
H Fencing	-	X	-
I Pools	X	-	-

The proposed works if carried out in accordance with recommendations within this *Flood Inundation & Risk Assessment Report* by Barrenjoey Consulting dated Sept 2019 will satisfy the intent of Clause 1.1 Performance Criteria of Pittwater 21 DCP Section B3.11 Flood Prone Land by complying with Clause 1.2 Prescriptive Controls. Noting the following measures are to be implemented into the works –

- **All occupants are to be informed of the sites flooding potential / impact and available warning services (ie : Councils *Floodwatch*, SES services etc).**
- **All occupants are to be informed of the sites flooding potential / impact and the residences 'shelter in place' capacity.**
- **All structures must be designed and constructed to ensure structural integrity up to the Flood Planning Level**
- **All occupants are to be informed of the sites flooding potential and requirements for goods / valuables storage etc.**

It is to be noted that, due to the many complex factors that can affect a site, the subjective nature of a risk analysis, and the imprecise nature of the science of flood analysis, the risk of persons being injured, to life and property cannot be completely removed. The recommendations within this Report do not remove the risk associated with the predicted flooding event, though lower those risks to an acceptable level reasonably anticipated by the community in everyday life.

Regards
BARRENJOEY CONSULTING ENGINEERS Pty Ltd

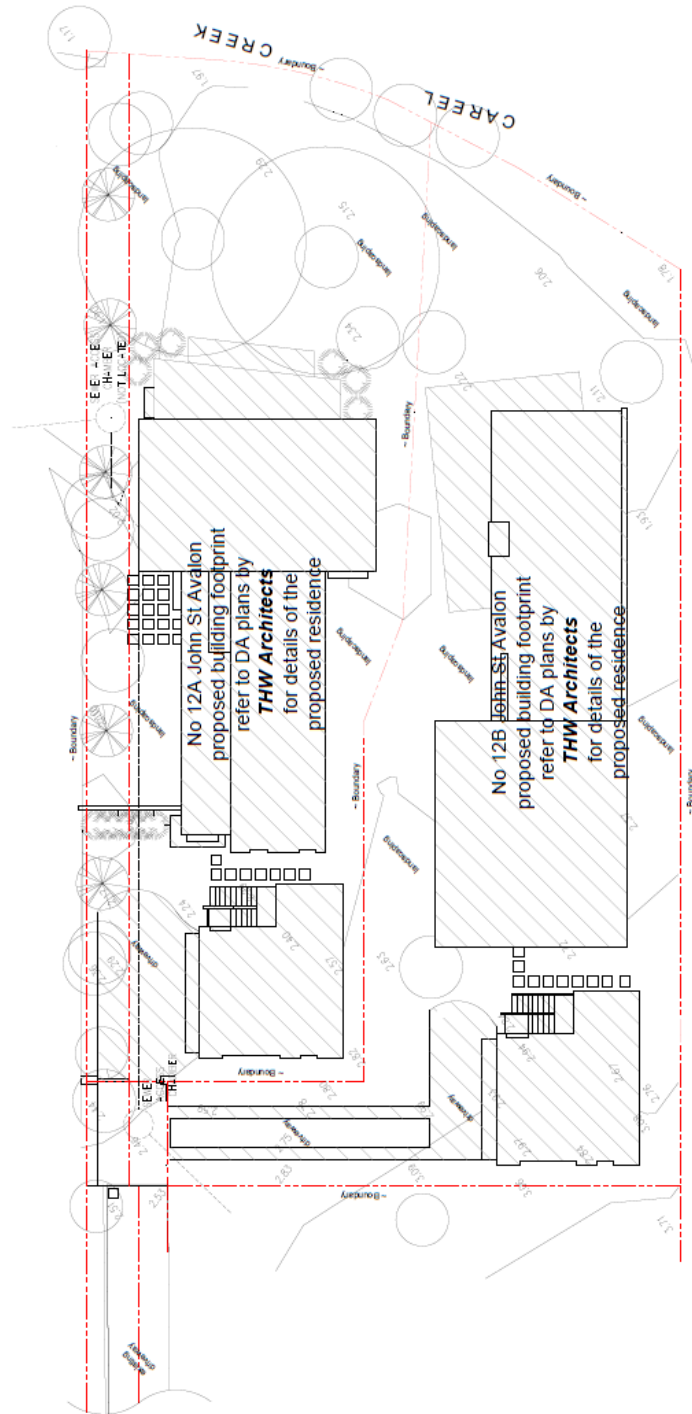


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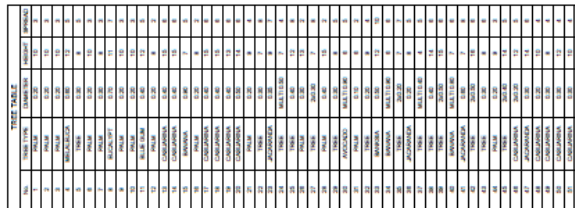
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Lucas Molloy (Director)
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Appendix A

Subdivision Plan



Appendix B
Site Survey
Bee & Lethbridge



Appendix C
Flood Information Request – Basic
Northern Beaches Council



northern
beaches
council

FLOOD INFORMATION REQUEST - BASIC

Property: 12 and 12A John St Avalon Beach

Lot DP: 1//1101318

Issue Date: 14/10/2019

Flood Study Reference: Avalon to Palm Beach Floodplain Risk Management Study and Plan 2017, Manly Hydraulics Laboratory

Flood Information for lot:

Flood Life Hazard Category – See Map A

1% AEP – See Flood Map B

1% AEP Maximum Water Level³: 2.55 m AHD

1% AEP Maximum Peak Depth from natural ground level³: 1.38 m

1% AEP Maximum Velocity: 1.19 m/s

1% AEP Hydraulic Categorisation: Floodway See Flood Map E

Flood Planning Area – See Flood Map C

Flood Planning Level (FPL) ^{1,2,3&4}: 3.05 m AHD

Probable Maximum Flood (PMF) – See Flood Map D

PMF Maximum Water Level²: 3.58 m AHD

PMF Maximum Depth from natural ground level: 2.36 m

PMF Maximum Velocity: 3.08 m/s

Flood Risk Precinct – See Map F

¹The flood information does not take into account any local overland flow issues nor private stormwater drainage systems.

²Overland flow/mainstream water levels may vary across a sloping site, resulting in variable minimum floor/flood planning levels across the site.

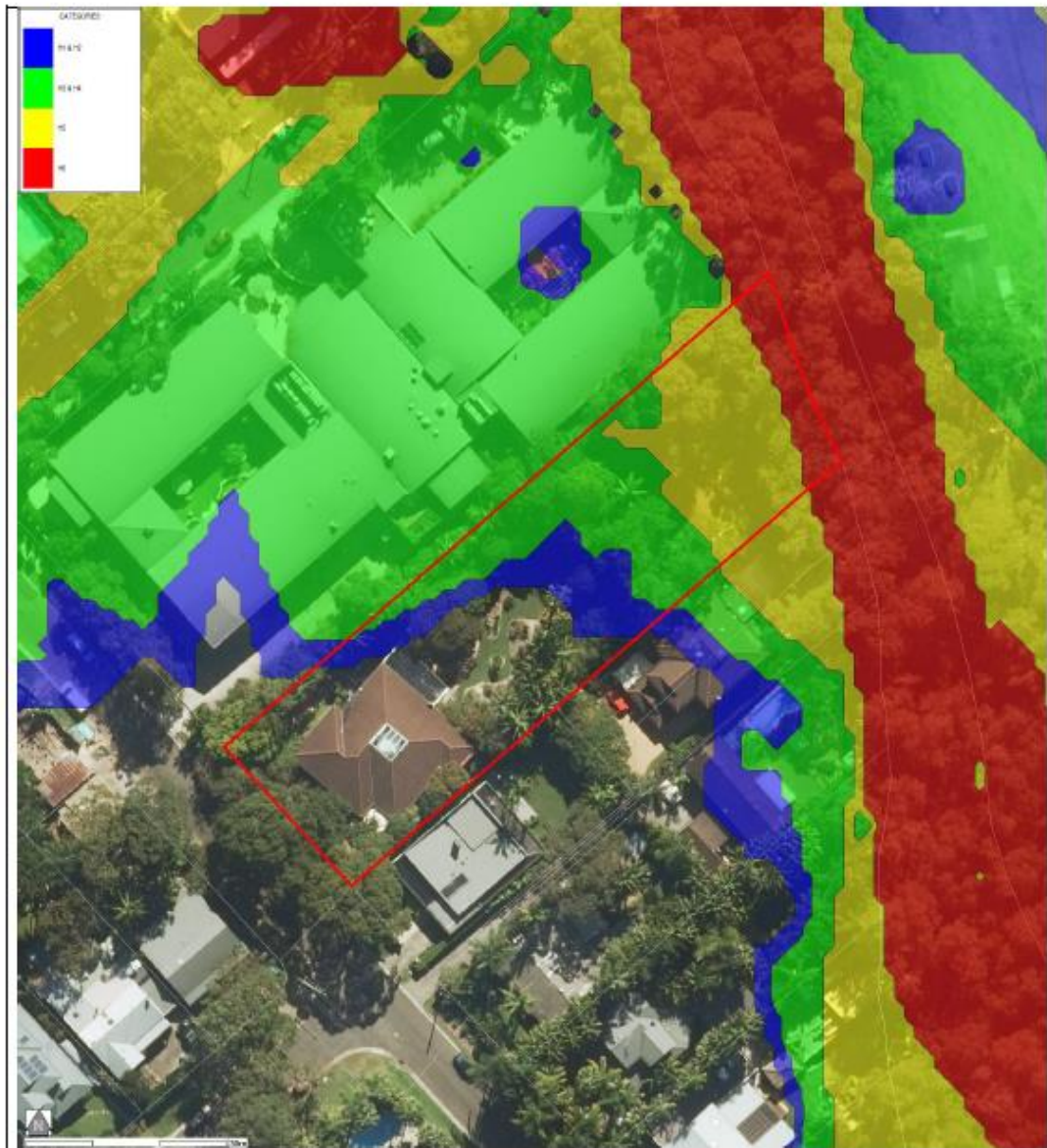
³Intensification of development in the former Pittwater LGA requires the consideration of climate change impacts which may result in higher minimum floor levels than those indicated on this flood advice.

⁴Vulnerable/critical developments require higher minimum floor levels using the higher of the PMF or Flood Planning Level

General Notes:

- All levels are based on Australian Height Datum (AHD) unless otherwise noted.
- This is currently the best available information on flooding; it may be subject to change in the future.
- Council recommends that you obtain a detailed survey of the above property and surrounds to AHD by a registered surveyor to determine any features that may influence the predicted extent or frequency of flooding. It is recommended you compare the flood level to the ground and floor levels to determine the level of risk the property may experience should flooding occur.
- Development approval is dependent on a range of issues, including compliance with all relevant provisions of Northern Beaches Council's Local Environmental Plans and Development Control Plans.
- Please note that the information contained within this letter is general advice only as a detail survey of the property as well as other information is not available. Council recommends that you engage a suitably experienced consultant to provide site specific flooding advice prior to making any decisions relating to the purchase or development of this property.
- The Flood Studies on which Council's flood information is based are available on Council's website.

FLOOD MAP A: FLOOD LIFE HAZARD CATEGORY



Notes:

- Refer to 'Flood Emergency Response Planning for Development in Pittwater Policy' for additional information on the Flood Life Hazard Categories and Pittwater 21 DCP Control B3.12.
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Avalon to Palm Beach Floodplain Risk Management Study and Plan 2017, Manly Hydraulics Laboratory) and aerial photography (Source: NearMap 2014) are indicative only.

FLOOD MAP B: FLOODING - 1% AEP EXTENT



Notes:

- Extent represents the 1% annual Exceedance Probability (AEP) flood event.
- Flood events exceeding the 1% AEP can occur on this site.
- Extent does not include climate change.
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Avalon to Palm Beach Floodplain Risk Management Study and Plan 2017, Manly Hydraulics Laboratory) and aerial photography (Source: NearMap 2014) are indicative only.

FLOOD MAP C: FLOOD PLANNING AREA EXTENT



Notes:

- Extent represents the 1% annual Exceedance Probability (AEP) flood event + freeboard.
- Extent does not include climate change.
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Avalon to Palm Beach Floodplain Risk Management Study and Plan 2017, Manly Hydraulics Laboratory) and aerial photography (Source: NearMap 2014) are indicative only.

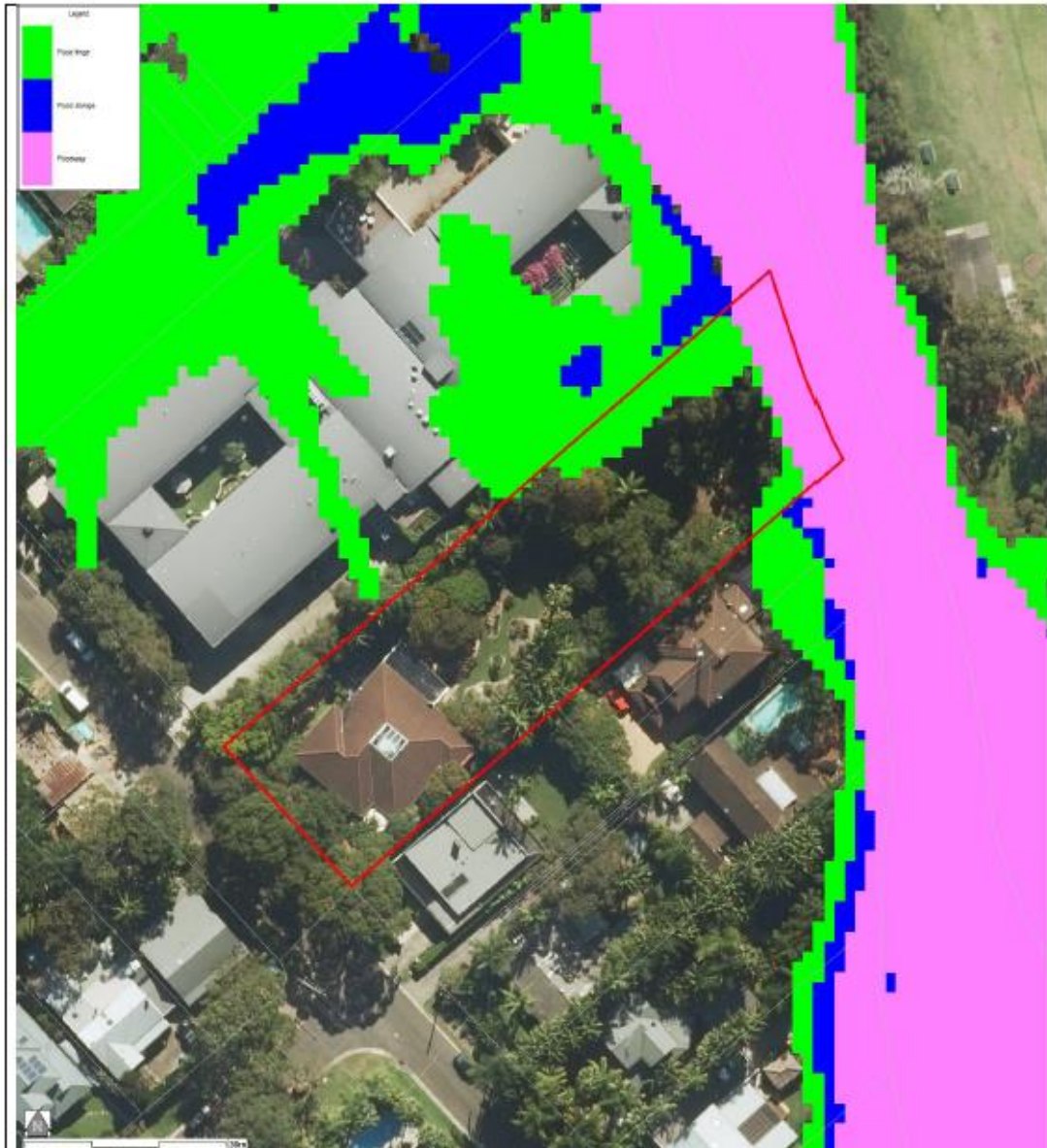
FLOOD MAP D: PROBABLE MAXIMUM FLOOD EXTENT



Notes:

- Extent represents the Probable Maximum Flood (PMF) flood event.
- Extent does not include climate change.
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Avalon to Palm Beach Floodplain Risk Management Study and Plan 2017, Manly Hydraulics Laboratory) and aerial photography (Source: NearMap 2014) are indicative only.

FLOOD MAP E: 1% AEP FLOOD HYDRAULIC CATEGORY EXTENT MAP



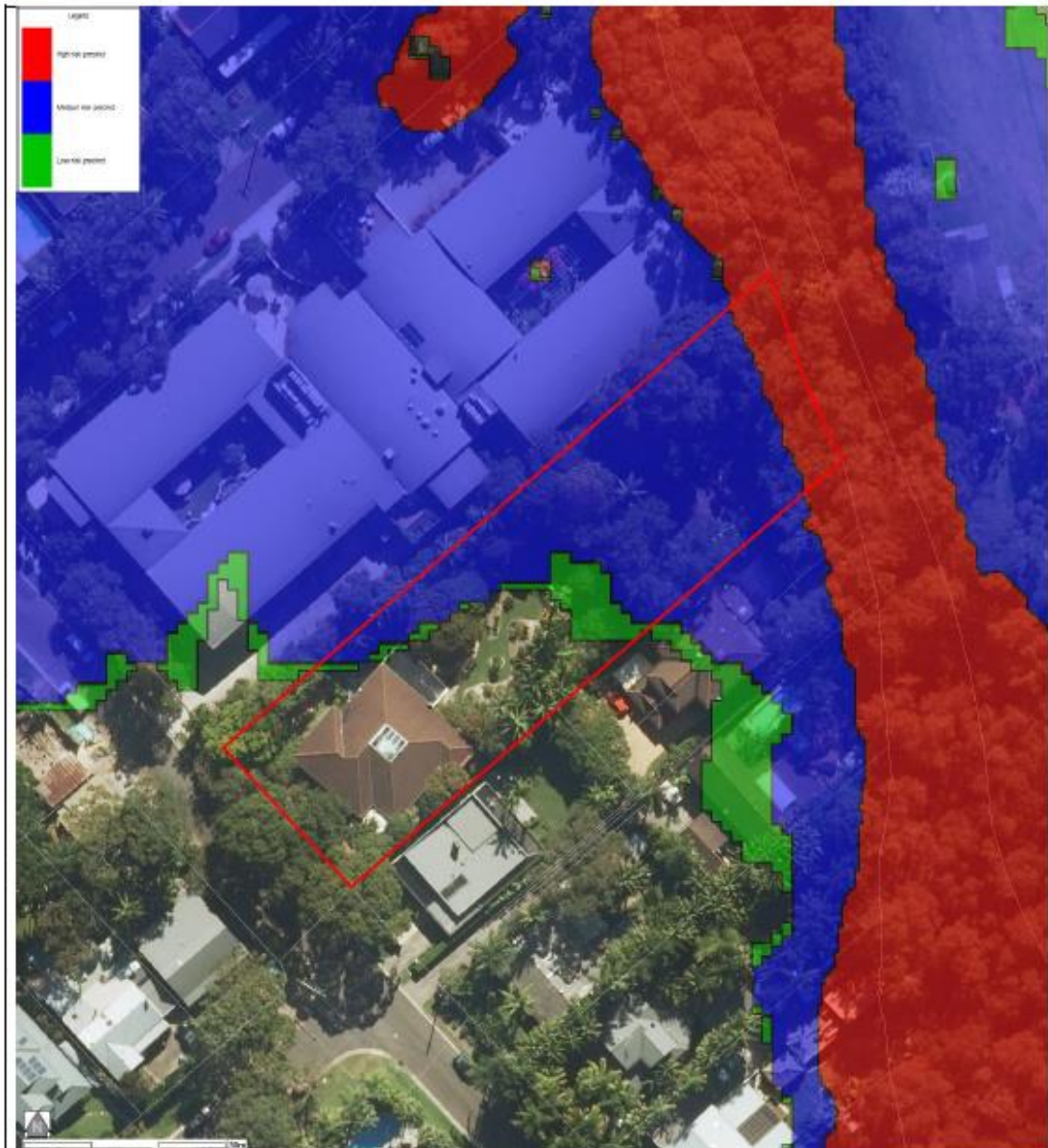
Notes:

- Extent represents the 1% annual Exceedance Probability (AEP) flood event.
- Extent does not include climate change.
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Avalon to Palm Beach Floodplain Risk Management Study and Plan 2017, Manly Hydraulics Laboratory) and aerial photography (Source: NearMap 2014) are indicative only.

Issue Date: 14/10/2019

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FLOOD MAP F: FLOOD RISK PRECINCT MAP



Notes:

- **Low Flood Risk precinct** means all flood prone land not identified within the High or Medium flood risk precincts.
- **Medium Flood Risk precinct** means all flood prone land that is (a) within the 1% AEP Flood Planning Area; and (b) is not within the high flood risk precinct.
- **High Flood Risk precinct** means all flood prone land (a) within the 1% AEP Flood Planning Area; and (b) is either subject to a high hydraulic hazard, within the floodway or subject to significant evacuation difficulties (H5 and or H6 Life Hazard Classification)

GUIDELINES for Preparing a Flood Management Report

Introduction

These guidelines are intended to provide advice to applicants on preparing a Flood Management Report. The purpose of a Flood Management Report is to help applicants measure and manage the flood risk to life and property on their site.

When is a Flood Management Report required?

A Flood Management Report must be submitted with any Development Application on flood prone land, for Council to consider the potential flood impacts and controls. For Residential or Commercial development, it is required for development on land identified within the Medium or High Flood Risk Precinct. For Vulnerable or Critical development, it is required if it is within any Flood Risk Precinct.

Note that the flood extents shown on the mapping are indicative only. It is recommended that flood levels are compared to registered ground survey to more accurately determine the flood extent.

There are some circumstances where a Flood Management Report undertaken by a professional engineer may not be required. However, the relevant parts of the DCP and LEP would still need to be addressed, so as to demonstrate compliance. Examples where this may apply include:

- If all proposed works are located outside the relevant Flood Risk Precinct extent
- First floor addition only, where the floor level is above the Probable Maximum Flood level
- Internal works only, where habitable floor areas below the Flood Planning Level are not being increased

Note that development on flood prone land will still be assessed for compliance with the relevant DCP and LEP, and may still be subject to flood related development controls.

What is in a Flood Management Report?

The aim of a Flood Management Report is to demonstrate how a proposed development will comply with the flood related development controls outlined in the relevant LEP and DCP clauses. The report must detail the design, measures and controls needed to achieve compliance, following the steps outlined below.

A Flood Management Report should reflect the size, type and location of the development, proportionate to the scope of the works proposed, and considering its relationship to surrounding development. The report should also assess the flood risk to life and property.

Technical requirements of a Flood Management Report

The technical requirements of a Flood Management Report should include (where relevant):

1. Description of development

The description of development should identify:

- Outline of the proposed development, with plans if necessary for clarity
- Use of the building, hours of operation, proposed traffic usage or movement
- Type of use, ie, critical, vulnerable, subdivision, residential, business, industrial, recreational, environmental or concessional

2. Flood analysis

The flood analysis should include:

- Predicted 1 in 100 year flood level
- Flood Planning Level (FPL)
- Probable Maximum Flood (PMF) level
- Flood Risk Precinct, ie High, Medium or Low
- Flood Life Hazard Category (in former Pittwater Council area only)
- Mapping of relevant extents
- Flood characteristics for the site, eg depth, velocity, hazard and hydraulic category, and the impact these have on the proposed development

Note that if the property is affected by estuarine flooding or other coastal issues, these need to be addressed separately under the relevant DCP.

3. Assessment of impacts

The assessment of impacts should address the various elements of the relevant LEP and DCP. A simple compliance table should be provided, similar to the table one below.

	Compliance		
	Not Applicable	Yes	No
A Flood effects caused by Development			
B Drainage Infrastructure & Creek Works			
C Building Components & Structural			
D Storage of Goods			
E Flood Emergency Response			
F Floor Levels			
G Car Parking			
H Fencing			
I Pools			

Further details of what is required for each of these categories can be found in the *Development Control Plan for Flood Prone Land*.

For any of these categories which are applicable, the assessment should demonstrate how the development complies, or if it doesn't, provide an explanation of why the development should still be considered.

Reporting requirements for a Flood Management Report

The Flood Management Report should include:

- Executive summary
- Location plan, at an appropriate scale, that includes geographical features, street names and identifies all waterways and Council stormwater pipes, pits and easements
- Plan of the proposed development site showing the extent of the predicted 100 year, any high hazard or floodway conditions and the PMF flood event
- Development recommendations and construction methodologies
- Calculation formulae (particularly for flood storage)
- Clear referencing using an accepted academic referencing system (eg. Harvard)
- Analysis of development against relevant State Environmental Planning Policies
- Analysis of development against relevant Local Environment Plan and Policies
- Conclusion detailing key points
- Standard Hydraulic Certification (Form A/A1)
- Qualifications of author
- Any flood advice provided by Council
- Any other details which may be relevant

NOTE: Qualifications of Author

Council requires that the Flood Management Report be prepared by a suitably qualified Engineer with experience in flood design / management who has, or is eligible for, membership to the Australian Institute of Engineers.

For further information please contact Stormwater and Floodplain Team on 1300 434 434 or via email at floodplain@northernbeaches.nsw.gov.au

Attachment A

NORTHERN BEACHES COUNCIL STANDARD HYDRAULIC CERTIFICATION FORM

FORM A/A1 – To be submitted with Development Application

Development Application for

Address of site: _____

Declaration made by hydraulic engineer or professional consultant specialising in flooding/flood risk management as part of undertaking the Flood Management Report:

I, _____ on behalf of _____
(Insert Name) (Trading or Business/ Company Name)

on this the _____ certify that I am engineer or a
(Date)

professional consultant specialising in flooding and I am authorised by the above organisation/ company to issue this document and to certify that the organisation/ company has a current professional indemnity policy of at least \$2 million.

Flood Management Report Details:

Report Title:

Report Date:

Author:

Author's Company/Organisation:

I: _____
(Insert Name)

Please tick all that are applicable (more than one box can be ticked)

☐ have obtained and included flood information from Council (must be less than 12 months old) (This is mandatory)

☐ have followed Council's Guidelines for Preparing a Flood Management Report

☐ have requested a variation to one or more of the flood related development controls. Details are provided in the *Flood Management Report*.

Signature

Name

Issue Date: 14/10/2019

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Appendix E
Northern Beaches Council
Standard Hydraulic Certification Form

**NORTHERN BEACHES COUNCIL
STANDARD HYDRAULIC CERTIFICATION FORM**

FORM A/A1 – To be submitted with Development Application

Development Application for

Address of site: **12A John St Avalon**

Declaration made by hydraulic engineer or professional consultant specialising in flooding/flood risk management as part of undertaking the Flood Management Report:

I, **Lucas Molloy** on behalf of **Barrenjoey Consulting Engineers p/l** on this the **8th Nov 2019** certify that I am engineer or a professional consultant specialising in flooding and I am authorised by the above organisation/ company to issue this document and to certify that the organisation/ company has a current professional indemnity policy of at least \$2 million.

Flood Management Report Details:

Report Title:

**FLOOD INUNDATION &
RISK ASSESSMENT REPORT
PROPOSED SUBDIVISION
12A PARK ST AVALON**

Report Date:

Nov 2019

Author:

Lucas Molloy

Author's Company/Organisation:

Barrenjoey Consulting Engineers p/l

I: **Lucas Molloy**

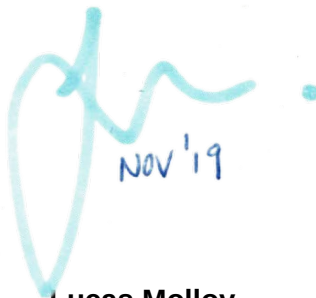
Please tick all that are applicable (more than one box can be ticked)

X have obtained and included flood information from Council (must be less than 12 months old)

X have followed Council's Guidelines for Preparing a Flood Management Report

na have requested a variation to one or more of the flood related development controls. Details are provided in the *Flood Management Report*.

Signature



Name

**Lucas Molloy
BE CPEng NER 788184
Director
Barrenjoey Consulting Engineers p/l**

End